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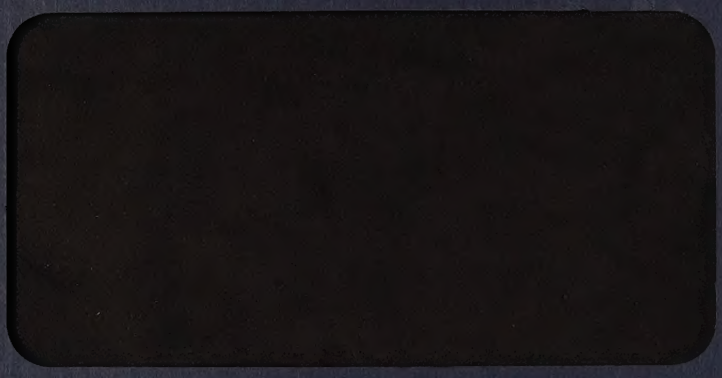
9310

LeCroy 9310 Series

Digital Oscilloscopes

SERVICE MANUAL



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93

LeCroy 9310 Series

Digital Oscilloscopes

S E R V I C E M A N U A L

Version 2.0

April 1993

Second printing

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SECTION 1 GENERAL INFORMATION

1.1 Initial Inspection

It is recommended that the shipment be thoroughly inspected immediately upon delivery to the purchaser. All material in the container should be checked against the enclosed Packing List. LeCroy cannot accept responsibility for shortages in comparison with the Packing List unless notified promptly. If the shipment is damaged in any way, please contact the Customer Service Department or local field office immediately.

1.2 Warranty

LeCroy warrants its oscilloscope products to operate within specifications under normal use for a period of two years from date of shipment. Spares, replacement parts and repairs are warranted for 90 days. The instrument's firmware is thoroughly tested and thought to be functional, but is supplied "as is" with no warranty of any kind covering detailed performance. Products not manufactured by LeCroy are covered solely by the warranty of the original equipment manufacturer.

In exercising this warranty, LeCroy will repair or, at its option, replace any product returned to the Customer Service Department or an authorized service facility within the warranty period, provided that the warrantor's examination discloses that the product is defective due to workmanship or materials and that the defect has not been caused by misuse, neglect, accident or abnormal conditions or operation.

LeCroy will return all in-warranty products with transportation prepaid.

This warranty is in lieu of all other warranties, expressed or implied, including but not limited to any implied warranty of merchantability, fitness, or adequacy for any particular purpose or use. LeCroy shall not be liable for any special, incidental, or consequential damages, whether in contract or otherwise.

1.3 Product Assistance

Answers to questions concerning installation, calibration, and use of LeCroy equipment are available from the Customer Service Department, 700 Chestnut Ridge road, Chestnut Ridge, New York 10977-6499, U.S.A., tel: (914) 578-6060, or 6061, and 2 rue du Pré-de-la-Fontaine, 1217 Meyrin 1, Geneva, Switzerland, tel: (41) 22 / 719.21.11, or your local field engineering office.

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1.5 Maintenance Agreements

LeCroy offers a selection of customer support services. Maintenance agreements provide extended warranty and allow the customer to budget maintenance costs after the initial two year warranty has expired. Other services such as installation, training, enhancements and on-site repair are available through specific Supplemental Support Agreements.

1.6 Documentation Discrepancies

LeCroy is committed to providing state-of-the-art instrumentation and is continually refining and improving the performance of its products. While physical modifications can be implemented quite rapidly, the corrected documentation frequently requires more time to produce. Consequently, this manual may not agree in every detail with the accompanying product. There may be small discrepancies in the values of components for the purposes of pulse shape, timing, offset, etc., and, occasionally, minor logic changes, Where any such inconsistencies exist, please be assured that the unit is correct and incorporates the most up-to-date circuitry. In a similar way the firmware may undergo revision when the instrument is serviced. Should this be the case, manual updates will be made available as necessary.

1.7 Service Procedure

Products requiring maintenance should be returned to the Customer Service Department or authorized service facility. LeCroy will repair or replace any product under warranty at no charge. The purchaser is only responsible for one way transportation charges.

For all LeCroy products in need of repair after the warranty period, the customer must provide a Purchase Order Number before repairs can be initiated. The customer will be billed for parts and labor for the repair, as well as for shipping.

1.8 Return Procedure

To determine your nearest authorized service facility, contact the Customer Service Department or your field office. All products returned for repair should be identified by the model and serial numbers and include a description of the defect or failure, name and phone number of the user, and, in the case of products returned to the factory, a Return Authorization Number (RAN). The RAN may be obtained by contacting the customer service department in New York, tel: (914)578-6060, or 6061 ; in Geneva, tel: (41)22/719.21.11, or your nearest sales office.

Return shipment should be made prepaid. LeCroy will not accept C.O.D. or Collect Return Shipments. Air-freight is generally recommended. Wherever possible, the original shipping carton should be used. If a substitute carton is used, it should be rigid and be packed such that the product is surrounded with a minimum of four inches of excelsior or similar shock-absorbing material. In addressing the shipment, it is important that the Return Authorization Number be displayed on the outside of the container to ensure its prompt routing to the proper department within LeCroy.

1.9 Safety Precautions.

The following servicing instructions are for use by qualified personnel only. Do not perform any servicing other than contained in service instructions. Refer to procedures prior to performing any service.

Exercise extreme safety when testing high energy power circuits. Always turn the power OFF, disconnect the power cord, discharge the cathode ray tube and all capacitors before disassembling the instrument.

The **W A R N I N G** symbol used in this manual indicates dangers that could result in personal injury.

The **C A U T I O N** symbol used in this manual identify conditions or practices that could damage the instrument.

1.10 Antistatic Precautions

C A U T I O N

Any static charge that builds on your person or clothing may be sufficient to destroy CMOS components, integrated circuits.
In order to avoid possible damage, the usual precautions against static electricity are required.

- Handle the boards in antistatic boxes or containers with foam specially designed to prevent static build-up.
- Ground yourself with a suitable wrist strap.
- Disassembly the instrument at a properly grounded work station equipped with antistatic mat.
- When handling the boards, do not touch the pins.
- Stock the boards in antistatic bags.

SECTION 2 SPECIFICATIONS

9310/9310M/9310L

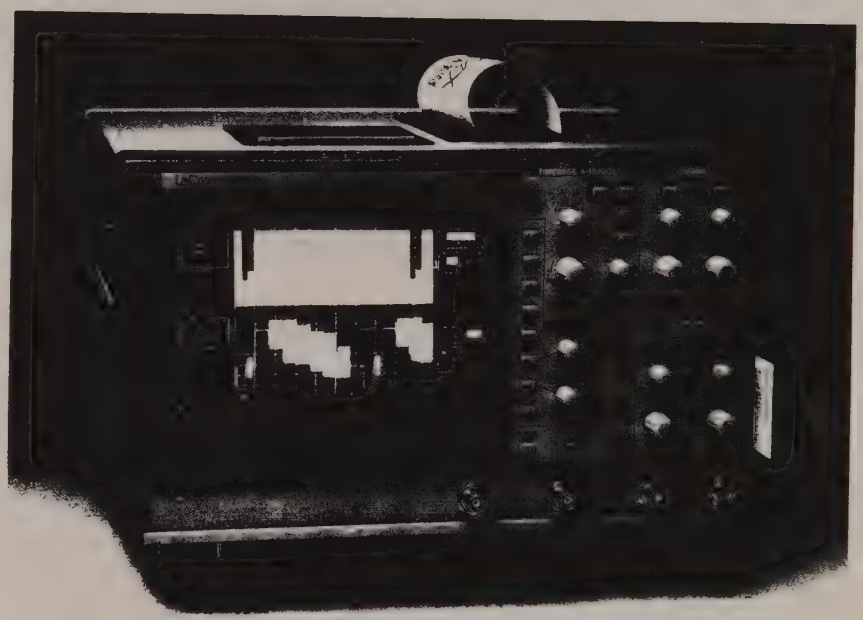
LeCroy

The Digital Scope Specialists

9310, 9310M, 9310L Digital Oscilloscopes 300 MHz Bandwidth, 100 MS/sec

Main Features

- 10K, 50K and 1M Word Records
- DOS Compatible Floppy Disk and Memory Card options
- Optional Internal Printer
- Glitch, Interval, Window, Dropout, TV and State-Qualified Triggers
- Automatic PASS/FAIL testing
- 8-bit vertical resolution; 11 with ERES option
- Fully programmable via GPIB and RS-232-C
- Persistence, XY and Roll Modes
- Advanced Signal Processing
- Two Independent Channels



The 9310 is the ideal general-purpose 2-channel 300 MHz digital oscilloscope. It captures single-shot events at up to 100 MSamples/sec, and repetitive signals at 10 GSamples/sec. Record lengths up to 1M Word provide unequalled horizontal resolution, and allow fast digitizing of long-duration events. Memories can be segmented, for minimum dead time between acquisitions.

Live waveforms may be viewed simultaneously with up to 3 expansions, showing all of the signal detail. Expansions are shown as highlights on the main trace.

SMART Trigger modes like Glitch, Window and Dropout allow you to capture precisely the events of interest. A comprehensive range of signal processing functions, on live or stored waveforms, allows waveform manipulation without destroying the underlying data.

The 9310 features the proven user-interface of LeCroy's portable scope family. A bright, high-resolution 9" CRT allows optimum waveform viewing under any conditions. Menus and text are arranged around the graticules - they never overwrite the waveforms.

Each of the main control functions is dedicated to a single knob, to keep the 9310's performance at your fingertips.

DOS compatible floppy disk and memory card options store waveforms and test setups, and make transferring data to a PC easier than ever before. Hardcopies may be made on GPIB, RS-232-C or Centronics printers or plotters. An optional internal printer is also available.

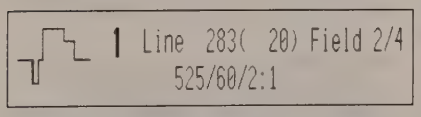
Optional packages provide extensive Waveform Processing including FFT and Enhanced Resolution to 11 bits.

Features and Benefits

PRECISION ACQUISITION
The 9310 combines all the technologies required for accurate waveform digitizing. Low-noise high-sensitivity amplifiers drive 8-bit ADC's which are clocked simultaneously by a high-precision timebase. Vertical resolution can be extended as high as 12 bits using averaging and filtering techniques. All these features are combined with a genuine 2 millivolt sensitivity setting and a big, crisp display to let you see the finest signal details.

MEMORY FOR ALL APPLICATIONS
The 9310 family is available with three different memory lengths: Standard, 10K words per channel, 50K words in the 9310M and 1M word in the 9310L. Long memories provide higher horizontal resolution, and LeCroy's unique memory management system maximizes the benefits of longer memory. Showing the entire waveform onscreen allows immediate location of glitches or other disturbances, and guarantees the highest possible sample rate at all timebase settings.

EXTENSIVE TRIGGER CAPABILITY
In normal operation, the 9310 triggers just like an analog oscilloscope. To capture rare or complex conditions, turn on the SMART trigger, and select from 11 different SMART trigger functions. These include GLITCH trigger down to 2.5ns and a unique DROPOUT mode, which causes a trigger to occur when the signal disappears for a selectable period of time. BISLOPE WINDOW and INTERVAL triggers are also available, together with TIME and EVENTS qualifiers. TV trigger allows individual lines or fields in PAL, SECAM, NTSC and non-standard video to be selected. Pre- and Post-trigger delay for all trigger modes are fully variable from the front panel.



Trigger Icons first developed for LeCroy's 9400 series show the trigger setup at a glance.

AUTOMATIC MEASUREMENTS
In addition to Cursor measurement. the 9310 performs fully Automatic Measurements. PASS/FAIL testing allows waveforms to be continually compared with a tolerance mask. (Masks may either be generated inside the instrument, or supplied on floppy disks or memory cards.) In addition, the 9310 can calculate any 5 waveform parameters from a list of 21, and compare them with user-defined limits. Any failure will cause preprogrammed actions such as Hardcopy, Save or GPIB SRQ. Basic statistics (low, high, average, standard deviation) may also be calculated on these parameters.

DOS COMPATIBLE MASS STORAGE
The 9310 offers two options (available together or separately) for built-in mass storage. Option FD01 provides a 3.5" 1.44MB floppy disk drive, which stores waveforms and setups as DOS files. This may be used as a convenient way of transferring data to a PC. Option MC01 provides high-speed storage to Industry-standard memory cards, which are also DOS compatible. Up to 8 MB of data (waveforms or setups) may be stored on a single card.

Mass Storage simplifies archiving, and can also be used to ensure that measurements are always made in the same way. Golden Waveforms (or tolerance masks) may also be stored, so that signals are compared with a known reference. Waveform processing is possible on live or stored waveforms.

BUILT-IN PRINTER
As well as driving most printers and plotters via GPIB (IEEE-488.2), RS-232-C and optional Centronics interfaces, the 9310 also offers an optional internal printer. This thermal printer produces full size screendumps in approximately 10 seconds.

FLEXIBLE INTERFACING
Both GPIB and RS-232-C interfaces may be used for full remote control of the instrument. All front-panel controls and internal processing functions can be controlled. For applications where throughput is essential, the 9310's GPIB interface can be used to transfer hundreds of waveforms per second.

POWERFUL DISPLAY MODES
The 9310's high-resolution raster display shows from one to four independent waveform grids. Persistence display mode allows easy viewing of signal changes over time, and XY mode plots any two sources against one another. Cursors are usable in all display modes.

MULTIPLE WAVEFORM ZOOM
The 9310 has four Zoom/Math traces which may be used for signal processing or zooming waveforms. Up to four traces (e.g. a waveform and three different expansions) may be viewed simultaneously. Alternatively, four different expansions of the same waveform may be viewed. Zoom factors of up to 20,000x (1 M memories) allow signal details to be examined.

The area to be expanded is selected by moving an intensified portion of the waveform. Cursor measurements may be made from one expanded portion to another, providing the most accurate time measurements possible.

EXTENSIVE WAVEFORM MATH
The 9310's built-in processing includes mathematics (Add, Subtract, Multiply and Divide, Negation and Identity) and Summation Averaging (up to 1000 sweeps). Option WP01 provides Averaging (Summed and Continuous) and Mathematics (including ABS, Differentiation, Identity, Integration, Log or Exp (base e or base 10), Negation, Reciprocal, Rescale, Sin(x)/x, Square and Square root). Also included is Enhanced Resolution mode (up to 11 bits) and Extrema mode for storage of peak positive and negative values. More information is available in the 9300 WP01 datasheet.

OPTIONAL FFT PACKAGE
Option WP02 provides comprehensive Spectral Analysis capabilities. These permit the system designer to identify characteristics which may not be apparent in the time domain. WP02 provides a wide selection of displayed projections (magnitude, phase, real, imaginary, power spectrum, power density) and windowing functions, as well as averaging in the frequency domain. For more information, see the 9300 WP02 datasheet.

9310, 9310M, 9310L Specifications

ACQUISITION SYSTEM
Bandwidth (-3 dB):
@ 50Ω: DC to 300 MHz
@ 1 MΩ DC: DC to 250 MHz
typical at the probe tip.
No. of Channels: 2
No. of Digitizers: 2
Maximum Sample Rate: 100 MS/sec simultaneously on each channel.
Aperture uncertainty: ± 10 psec.
Sensitivity: 2 mV/div to 5 V/div, fully variable.
Scale factors: Probe attenuation factors of X1, X10, X100, X1,000 and X10,000 selectable.
Offset Range: 2.0 - 9.9 mV/div: ± 120 mV
10.0 - 199 mV/div: ± 1.2 V
0.2 - 5.0 V/div: ± 24 V
DC Accuracy: ≤ ± 2% full scale (8 divisions)
Vertical Resolution: 8 bits.
Bandwidth Limiter: 30 MHz.
Input Coupling: AC, DC, GND.
Input Impedance: 1 MΩ||15 pF or 50Ω ± 1%
Max Input: 1 MΩ:250V (DC+peak AC≤ 10KHz)
50Ω:± 5V DC (500 mW) or 5V RMS

TIME BASE SYSTEM
Timebases: Main and up to 4 Zoom Traces. Any 4 traces may be viewed simultaneously.
Time/Div Range: 1 ns/div to 1000 s/div.
Clock Accuracy: ≤ ± 0.002%.
External Clock: DC - 100 MHz (Ext Trig BNC)
Interpolator resolution: 10 psec.
Interpolator accuracy: 15 psec RMS.
Roll Mode: ranges 500 ms to 1,000 s/div. (9310L with 1M memory: 10 s to 1,000 s/div)
Acquisition memories: (per channel)

9310	9310M	9310L
10K	50K	1M

ACQUISITION MODES
Random Interleaved Sampling (RIS): for repetitive signals from 1 ns/div to 5 µs/div.
Single shot: for transient and repetitive signals from 50 ns/div to 200 ms/div. (9310L with 1M memory: 50 ns/div to 5 s/div).
Sequence: Stores multiple events in segmented acquisition memories.
Number of segments available:

9310	9310M	9310L
2-50	2-200	2-2,000

Dead Time between segments: ≤150 µs

TRIGGERING SYSTEM
Trigger Modes:
Stop: Holds the last event acquired.
Normal: Re-arms after each sweep. If no trigger occurs after a reasonable length of time, the message "Slow Trigger" is displayed.
Auto: Automatically re-arms after each sweep. If no trigger occurs, one is generated at an appropriate rate.
Single (hold): Holds the next event to be acquired. Re-arms only when the "single" button is pressed again.

Trigger Sources: CH1, CH2, Line, Ext, Ext/10 (Slope, Level and Coupling for each can be set independently.)
Slope: Positive, Negative, Window (BiSlope).
Coupling: AC, DC, HF, LFREJ, HFREJ.
Pre-trigger recording: 0 to 100% of full scale (adjustable in 0.1 div increments).
Post-trigger delay: 0 to 10,000 divisions (adjustable in 0.1 div increments).
Holdoff by time: 25 ns to 20s.
Holdoff by events: 0 to 99,999,999 events.
Trigger Bandwidth: Up to 500 MHz using HF coupling.
Internal Trigger Sensitivity Range: ± 5 div.
Ext Trigger Input: 1 MΩ||15pF, 250V Max. (DC+peak AC≤ 10KHz).
Ext Trigger Range: ±2V (±20V with Ext/10).
Trigger Timing: Trigger Date and Time are listed in the Memory Status Menu.

SMART TRIGGER TYPES
Pulse Width: Trigger on pulse width between two limits selectable from 2.5ns to 20s.
Interval Width: Trigger on pulse spacing between two limits from 2.5ns to 20s.
Dropout: Trigger if the input signal drops out for longer than a timeout from 25ns to 20s.
State/Edge Qualified: Trigger on any source only if a given state (or transition) has occurred on one of the other possible sources. The delay between these events can be defined as a number of events on the trigger channel or as a time interval.
TV: Allows selection of both line (up to 1500) and field number (up to 8) for PAL, SECAM, NTSC or non-standard video.

DISPLAY
Waveform style: Vectors connect the individual sample points, which are highlighted as dots.
CRT: 12.5x17.5 cm (9" diagonal) raster.
Resolution: 810 x 696 points.
Modes: Normal, X-Y, Infinite Persistence.
Real-time Clock: Date, hours, minutes, sec.
Graticules: Internally generated; separate intensity control for grids and waveforms.
Grids: 1, 2 or 4 grids.
Formats: YT, XY, and both together.
Vertical Zoom: Up to 5x Vertical Expansion (50x with averaging, up to 40 µV sensitivity).
Horizontal Zoom Factors:

9310	9310M	9310L
up to 200x	1,000x	20,000x

INTERNAL MEMORY
Waveform Memory: Four 16-bit Memories (M1,M2,M3,M4) for full 10K or 50K records.
Processing Memory: Four 16-bit Waveform Processing Memories (A,B,C,D) of 10K or 50K.
Setup Memory: Four non-volatile memories.

MEASUREMENT SYSTEM
Automatic Measurements determine:

Amplitude	Frequency	Period
Area	Maximum	Peak to Peak
Base	Mean	Risetime
Cycles	Median	RMS
Delay	Minimum	Std Dev
Duty Cycle	Overshoot +	Top
Falltime	Overshoot -	Width

(As defined by ANSI/IEEE Std 181-1977).

Two cross-hair cursors are used to define the region over which these parameters are calculated. The following statistical calculations are also available for each measurement: Average, High, Low, Standard Deviation.

Pass/Fail testing allows up to five of the above listed parameters to be tested against selectable thresholds. Waveform Limit Testing is performed using templates which may be defined inside the instrument.

CURSOR MEASUREMENTS
Relative Time: Two cursors provide time measurements with resolution of ±0.05% full-scale. The corresponding frequency value is also displayed.
Relative Voltage: Two horizontal bars measure voltage differences up to ±0.2% of full-scale in single-grid mode.
Absolute Time: A cross-hair marker measures time relative to the trigger and voltage with respect to ground.
Absolute Voltage: A reference bar measures voltage with respect to ground.

WAVEFORM PROCESSING
Up to four processing functions may be performed simultaneously. Functions available are: Add, Subtract, Multiply, Divide, Negate, Identity and Summation Averaging.

Average: Summed Averaging of up to 1,000 waveforms in the basic instrument. Up to 10^6 averages are possible with Option WP01.
Envelope*: Max, Min, or Max and Min values of from 1 to 10^6 waveforms.
ERES*: Low-Pass digital filter provides up to 11 bits vertical resolution.
Sampled data is always available, even when trace is turned off. Any of the above modes can be invoked without destroying the data.

*Envelope and ERES modes are provided in Math Package WP01.

AUTOSETUP
Pressing Autosetup sets timebase, trigger and sensitivity to display a wide range of repetitive signals. (Amplitude 2mV to 40V; frequency above 50Hz; Duty cycle greater than 0.1%).
Autosetup Time: Approximately 2 seconds.
Vertical Find: Automatically sets sensitivity and offset.

SELF TESTS
Auto-calibration ensures specified DC and timing accuracy.

INTERFACING
Remote Control: of all front-panel controls, as well as all internal functions is possible by GPIB and RS-232-C.
RS-232-C Port: Asynchronous up to 19200 baud for computer/terminal control or printer/plotter connection.
GPIB Port: (IEEE-488.1) Configurable as talker/listener for computer control and fast data transfer. Command Language complies with requirements of IEEE-488.2
Centronics: Optional parallel interface.
Hardcopy: Screen dumps are activated by a front-panel button or via remote control. TIFF format is available for importing to DTP programs. The following printers and plotters can be used to make hardcopies: HP ThinkJet, QuietJet, LaserJet, PaintJet (color), DeskJet (color) and EPSON printers. HP 7400 and 7500 series, or HPGL compatible plotters. An optional internal printer is also available.

PROBES
Model: Two 9020 (X10, 10 MΩ // 15 pF) probes supplied.
Probe calibrator: BNC connector provides rectangular pulses, 250 mV into 50Ω, 50% duty cycle; rise/fall times < 500 psec; flatness <1%; zero offset, programmable frequency. May also provide, under menu control, a Trigger Output or Pass/Fail Output.

GENERAL
Temperature: 5° to 40° C (41° to 104° F) rated 0° to 50° C (32° to 122° F) operating.
Humidity: < 80%.
Shock & Vibration: Meets MIL-STD-810C modified to LeCroy design specifications and MIL-T-28800C.
Power: 90-250 V AC, 45-66 Hz, 150 W.
Battery Backup: Front-panel settings maintained for two years.
Dimensions: (HWD) 8.5"x14.5"x16.25", 210mm x 370mm x 410mm.
Weight: 10kg (22lbs) net, 15.5kg (34lbs) shipping.
Warranty: Two years.

Ordering Information

Oscilloscope and Options

9310/M/L	Digital Oscilloscope
9310-WP01	Waveform Math
9310-WP02	FFT Processing
9310-MC01	Memory Card Reader
9310-FD01	3.5" Floppy Disk Drive + Centronics Interface
9310-GP01	Internal Printer + Centronics Interface
93XX-GP-R	Roll paper for Printer (10 rolls)

Oscilloscope Accessories
Supplied with Instrument:

9310-OM	Operator's Manual
9310-SM	Service Manual
9310-FC	Front Cover

Ordered separately:

9310-MC02	128K Memory Card
9310-MC04	512K Memory Card
DC/GPIB-2	2 Meter GPIB Cable
SG9001	High Voltage Protector
OC9001	Oscilloscope Cart

USA Direct Sales: 1 (800) 5LE-CROY

LeCroy Worldwide Sales Offices

ASIA/PACIFIC	LeCroy Pty Ltd	61.38.90.7358
BENELUX	LeCroy BV	04902.8.9285
CANADA	LeCroy Canada	514.928.4707
FRANCE	LeCroy SARL	(1).69.18.83.20
GERMANY	LeCroy GmbH	06221 83.10.01
ITALY Milano	LeCroy SRL	02.204.70.82
ITALY Rome	LeCroy SRL	06.336.797.00
JAPAN Osaka	LeCroy Japan	0816.330.0961
JAPAN Tokyo	LeCroy Japan	0813.3376.9400
SWITZERLAND	Geneva	022.719.21.11
SWITZERLAND	Lenzburg	064.51.91.81
United Kingdom	LeCroy Ltd	0235-533114

Other sales and service representatives throughout the world.

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LeCroy
The Digital Scope Specialists

9300 series internal 3.5" Floppy, RAM card, Printer

Main Features

- 3.5" Floppy drive, DOS format, affordable and convenient
- Ultra-fast RAM card, DOS format, ideal for PASS/FAIL testing
- High-resolution Printer, ideal for fast, on-the-spot documentation
- Convenient Hardcopy storage to card/disk

3.5" Floppy

The floppy drive is a convenient storage medium, not only for saving and retrieving waveforms or instrument settings, but also for storing hardcopies that can be printed from a PC when desired. The floppy supports both 720K and 1.44M DOS formats so that it can be read back on any PC with a 3.5" drive, avoiding the need to interface the oscilloscope to your PC. As with the RAM-card option, the floppy system capabilities include automatic storage of data under pre-programmed conditions.

RAM Card

The RAM card is a fast and compact storage medium for saving and retrieving waveforms or instrument settings. It complies fully with the PC industry's PCMCIA/JEIDA standard. With the special Autostore feature, waveforms can be automatically stored to the card after every acquisition, and "played back" when desired. And with the scope's powerful PASS/FAIL feature, failure data can also be saved automatically to the RAM card.

Printer

The internal printer is an invaluable tool for instant, on-the-spot documentation. It generates a clear, crisp hardcopy of the screen in just a few seconds. The printout's large size combined with its high-resolution provide you with an excellent document that matches the screen's superior quality even to the finest details. And because it frees you from the trouble of carrying and interfacing a bulky printer, it's the ideal solution for field measurements.

Mass-storage Features and Benefits

LeCroy's mass storage capabilities provide a range of benefits:
- Easy data transfers to PCs
- Waveform logging
- Waveform archiving for future use
- Faster troubleshooting
- Faster, more reproducible testing
- Shared oscilloscope resources

EASY DATA TRANSFERS TO PCs
Because the 9300 series oscilloscope uses DOS-formatted floppy disks and memory cards, transferring waveform data to a PC is a breeze. The removable storage allows transfers without cables, programming, or any knowledge of GPIB, RS-232, or other interfaces. And what's more, LeCroy provides, free of charge, a binary-to-ASCII format conversion program for the PC since some PC-based analysis packages (such as spreadsheets), require ASCII format.

WAVEFORM LOGGING
By using Glitch or Dropout triggering in combination with the powerful AUTOSTORE mode, LeCroy oscilloscopes can monitor and log intermittent problems automatically. To store a waveform, the oscilloscope opens and names a DOS-compatible file and then stores the waveform data into the file. This logging feature requires no operator intervention and maintains data and the operational setup through power line failures. Logged waveforms can be selectively played back by trigger time/date or by sequence number, or can be scrolled through sequentially.

WAVEFORM ARCHIVING FOR FUTURE USE
- Recallable proof of performance
- Additional data analysis as needed
- Accurate trend or drift monitoring
- Calibration procedure verification

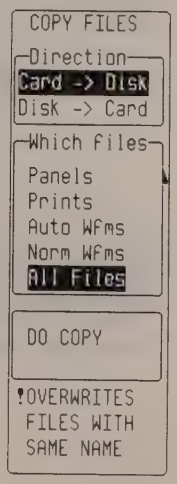
When storing waveforms, LeCroy DSOs also archive a header of setup information and the acquisition time/date. After recalling an archived waveform, the several hundred byte header ensures correct time and voltage scaling. When recalled into the oscilloscope, the waveform can be zoom expanded, compared, or analyzed just like a live waveform. The time/date offers proof of measurement authenticity and trend sequence.
All LeCroy DSOs store raw waveform data using one byte per sample point. Signal averaged, Enhanced Resolution (ERES) filtered, and other processed data use two bytes per point, to take advantage of the added resolution.

HARDCOPY ARCHIVING
Hardcopies of the screen can also be stored for future use. For instance, a screen saved in TIFF format can eventually be imported into a Word Processor to illustrate a report. As another example, field-measurement screens could be saved in LaserJet format on the memory card or floppy disk, and then printed from a PC back in the lab.

FASTER FIELD MEASUREMENTS
Recallable reference waveforms and oscilloscope setups for each test point on a Device Under Test (DUT) can make fault troubleshooting faster and more accurate. A dedicated memory card or floppy disk can hold all of the correct test point waveforms and associated DSO setups for a particular DUT.
The technician can recall stored setups quickly and consistently, thereby avoiding incorrect measurement conditions. He can then compare actual waveforms to recalled reference waveforms taken from a known working system. So the technician needs less knowledge and skill to quickly probe a large number of test points and verify that the correct waveforms exist.
If a problem is found, the aberrant waveform may be saved. It can later be shown to laboratory-based engineers, for example, for problem-solving guidance or for improvement of DUT design.
Memory cards, being rugged and shirt-pocket sized, are ideal for this application.

FASTER, MORE REPRODUCIBLE TESTING
LeCroy oscilloscopes can compare measured waveforms against upper and lower waveshape tolerances or against parameter limits, such as risetime, overshoot, or peak voltage, and make PASS/FAIL decisions. This PASS/FAIL testing decreases test times in GPIB-based ATE systems by reducing data transfers. It increases reproducibility and accuracy in manual tests by eliminating human errors.
Once defined, these tests may be saved by storing instrument setups which include the specified tolerances and/or reference waveforms. Different test personnel can easily share a common test library via PC network.
Waveshape test limits can be generated by capturing a "golden" waveform and by then selecting amplitude and timing limits (in fractions of screen graticule divisions). Or a user can create standard waveform limit templates on a computer (e.g. ANSI/CCITT telecommunication templates)
On LeCroy 9300 series DSOs, specific parameter tolerance test procedures are created by selecting limits for any five out of twenty pulse parameters with Boolean AND or OR conditions between them. During testing , FAIL responses can include an audible beep, GPIB SRQ, hardcopy output, or store to memory card.

SHARED OSCILLOSCOPE RESOURCES
Tired of spending hours to recover your precious setup after someone else used your instrument? Just plug-in your *personal* RAM card or floppy and restore your setup in just seconds. Each individual user can keep his own preferred setups on his own floppy disk or RAM card.



A selection of files can be copied from the memory card to the disk and vice-versa.

Hardcopy Features and Benefits

The internal printer adds a whole range of benefits to the LeCroy 9300 series:
- Ultra fast printouts
- High resolution printing
- No-trouble interfacing
- No-trouble carrying

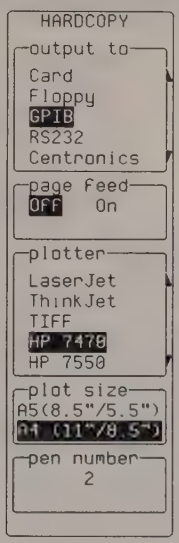
ULTRA-FAST PRINTOUTS
Measurement documentation is made easier - and faster - than ever since the internal printer produces a hardcopy in less than 10 seconds. What's more the document is date- and time-stamped: a real bonus for archiving those test results.

HIGH RESOLUTION PRINTING
With a resolution of 190 dots-per-inch, the internal printer matches the screen's superior quality, to document the captured traces down to their finest details. And the size of the printout is impressive for an internal printer: a full 7" diagonal!

TROUBLE-FREE INTERFACING
Tired of struggling with cable schematics, baud rates, gender-changers, and dip switches? The internal printer frees your mind for more productive tasks. Just select the internal printer in the scope's utilities menu, hit the SCREEN DUMP button, and you're in business!

TROUBLE-FREE TRANSPORTING
Having a printer totally integrated in the instrument makes life much easier for field-measurement applications. Imagine carrying a scope, a printer (and perhaps a floppy drive) in one hand!

The 9300 series oscilloscope supports a whole range of popular printers and plotters. Hardcopies of the screen can be either sent directly to the device or to the card/ floppy for future use.



OTHER HARDCOPY SOLUTIONS
High quality project reports, presentation materials, technical manuals, and troubleshooting instructions often require integration of text and graphics on the same page. Advanced PC desktop publishing - and more and more word processors - Such as Word-for-Windows, WordPerfect, or AMI Pro can directly import graphic files, size them, and position them anywhere on the page. Written text can then wrap around or be positioned within the graphics. LeCroy 9300 oscilloscopes can save screens in TIFF (Tagged Image Format File). After transferring the file to a PC, the DTP software can import and manipulate the document like any other graphic object.
The LeCroy 9300 series also offers a wide range of interfacing capabilities with external hardcopy devices:
- Plotters. HPGL, HP 7400 and 7500 compatible
- Printers. HP LaserJet, ThinkJet, Paintjet (including color), DeskJet (including color) and Epson
- Interfacing. RS-232, GPIB, or even Centronics (optional)

Floppy drive, RAM card and Printer Specifications

3.5" FLOPPY DRIVE
Type: 3.5 inch floppy drive, DOS format.
Supported disk formats: 720KB, 1.44MB
Maximum transfer rate: 15 kB/sec
Typical Waveform Transfer Speed:

Length	Store	Recall
1000	2.2 s	0.4 s
10000	2.7 s	1.0 s
50000	5.5 s	3.4 s

Waveform File Size: A channel-trace will use 1 byte per sample plus approximatively 359 bytes of waveform descriptor. A processed trace will use 2 bytes per sample.
Template Size: Approximatively 21K bytes.
Panel Setup Size: Approximatively 3K bytes.

RAM CARD
Type: PCMCIA 1.0 JEIDA 3.0 & 4.0.
Supported card formats: SRAM for reading and writing, ROM, OTP, and FLASH for reading, the driver software supports card sizes up to 8MB.
Maximum transfer rate: 170 kB/sec
Typical Waveform Transfer Speed:

Length	Store	Recall
1000	25 ms	20 ms
10000	100 ms	80 ms
50000	400 ms	300 ms

Waveform File Size: Same as for the floppy.
Template Size: Approximately 21K bytes.
Panel Setup Size: Approximately 3K bytes.

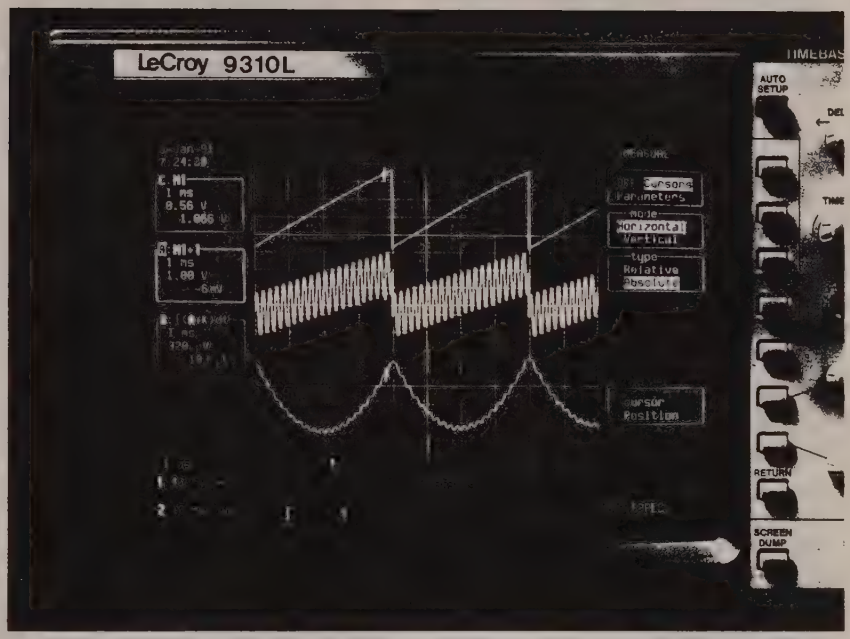
PRINTER
Type: Raster printer, thermal.
Resolution: 190 DPI.
Printout Size: 126 mm x 90 mm
Paper: Thermal printer paper, 30 meter roll, 110 mm width, type Seiko or similar.
Printing speed: 6 seconds approx. for one screen.

9300 WP01

WP01 Waveform Processing Firmware for the 9300 Family of Digital Oscilloscopes

Main Features

- Averaging - summation and continuous
- Arithmetic - including addition, subtraction, ratio and multiplication
- Functions - including integration, differentiation, log, expansion, ABS, square root and more
- Extrema mode - storage of extreme positive and negative values



Added as a factory option or retrofitted in the field, the WP01 Waveform Processing Package adds high-speed averaging, filtering and mathematical capabilities to the 9300 family of digital oscilloscopes.

General

The LeCroy WP01 Waveform Processing package offers powerful routines that extend the processing capabilities of the 9300 family of Digital Oscilloscopes.

All processing is built in to eliminate the need for external computers and controllers. High-speed microprocessors are used to ensure that computed waveforms are displayed instantly on the screen.

The package is fully programmable over GPIB or RS-232-C interface and hard copies can be directly made onto a wide range of printers.

Features and Benefits

EXTENSIVE SIGNAL AVERAGING
Two operation modes:
Summation averaging up to 1,000,000 waveforms.
Continuous averaging with weighting factors up to 1023.
Average speed up to 200,000 points/s in summation averaging mode.

EXTREMA MODE
Keeps track of time and amplitude drift by storing extreme positive and negative values, such as glitches, over a programmable number of sweeps.

POWERFUL ARITHMETIC
Processes addition, subtraction, multiplication or division on any pair of waveforms.

MATHEMATICAL FUNCTIONS
Computes identity, negation, reciprocal, integration, differentiation, square, square root, absolute value, sin x/x, exponential and log on any waveform.

ENHANCED RESOLUTION
Allows filtering of the digitized signals, whether they are single-shot or repetitive, in order to increase the resolution of the displayed trace from 8 bits to 11 bits in steps of 0.5 bits.

VERTICAL EXPANSION
Provides vertical scale expansion by a factor of up to 50.

CHAINING OF OPERATIONS
Automatically chains up to four operations. An indefinite number of operations can be performed sequentially, either manually or via remote control.

REMOTE CONTROL
Controls remotely all front-panel settings, as well as all waveform processing options via either GPIB or RS-232-C interfaces.

Functional Description

The WP01 waveform processing package can be implemented in any of the models of the 9300 family of digital oscilloscopes. This firmware is optimized for processing signals in real time. A powerful 68020 microprocessor and a 68881 co-processor enable very rapid representation of results such as averages, integrations, exponentials and multiplications.

Waveform operations can be performed on live, stored, processed or expanded waveforms. They are selected through simple menus that allow functions to be chained together allowing more complex computations. For example, it is possible to perform the integration of an averaged waveform or the multiplication of a differentiated waveform.

All processing occurs in function memories A, B, C and D which may be displayed on the screen by simply pressing the appropriate function button. All the necessary processing is automatically performed for all the functions selected.

The number of points used in the calculations is selectable and goes from 50 to 10,000 points for models with 10,000 data points of memory per channel. It goes up to 50,000 points for all other models.

SIGNAL AVERAGING
WP01 offers two powerful, high-speed averaging modes that can be used to reduce noise and improve the signal-to-noise ratio. Vertical resolution can be extended by several bits to improve dynamic range and increase the overall input sensitivity to as much as 50 mV/division.

Summed Averaging consists of the repeated addition (with equal weight) of recurrences of the selected source waveform. The number of acquisitions averaged can be selected up to 1,000,000 sweeps with the accumulation automatically stopping when the number is reached.

Continuous Averaging, sometimes called exponential averaging, is the repeated weighted average of the source waveform with the previous average. Averaging goes on indefinitely with each new acquisition and the effect of previous waveforms gradually tends to zero. Relative weighting factors can be chosen from 1:1 to 1:1023. The method is particularly useful for monitoring noisy signals which may change slowly over a period of time.

ENHANCED RESOLUTION
The WP01 package provides a selective filtering technique that improves vertical resolution for reduced bandwidth applications. By effectively removing high-frequency noise, with digital smoothing functions, waveforms can be analyzed with resolution from 8 to 11 bits. The technique can be used with both single-shot and repetitive signals and provides an ideal method for smoothing transient phenomena.

EXTREMA MODE
Tracking rare glitches or monitoring signals drifting in time and amplitude is made easy with EXTREMA mode. EXTREMA waveforms are produced by repeatedly comparing acquisitions of a source waveform with a stored waveform that contains previous maximum and/or minimum excursions. Whenever a given data point of a new acquisition exceeds the existing data point of the stored waveform, the old data point is replaced by the new. In this way the envelope of all waveforms is accumulated for up to a maximum of 1,000,000 sweeps.

ARITHMETIC
The 9300 family offers basic arithmetic operations such as addition, subtraction, division, multiplication and negation, even on the standard models. These arithmetic functions can be performed on any source waveform on a point-by-point basis. Different vertical gains and offsets of the source waveforms are automatically taken into account in the computed result.

MATHEMATICAL FUNCTIONS
Functions including differentiation, integration, absolute value, square, square root, logarithm (base 10 and e), exponential, reciprocal, and sin x/x interpolation may be performed on any source waveform. Arithmetical and mathematical functions can also be chained together to construct more complex processing routines.

SUMMATION AVERAGING
Number of Sweeps: 1 to 1,000,000.
Number of Input Points: 50 to 50,000 (50 to 10,000 for models with 10,000 data points per channel).
Vertical Expansion: 50 x maximum.
Maximum Sensitivity: 50 mV/div after vertical expansion.
Speed: up to 200,000 points/s.

CONTINUOUS AVERAGING
Possible Weighting Factors: 1:1, 1:3, 1:7, 1:15, 1:31, 1:63, 1:127, 1:255, 1:511 and 1:1023.
Number of Input Points: 50 to 50,000 (50 to 10,000 for models with 10,000 data points per channel).
Vertical Expansion: 50 x maximum.
Maximum Sensitivity: 50 mV/div after vertical expansion.

ARITHMETIC
Addition, subtraction, multiplication, and ratio on any two waveforms.
Number of Input Points: 50 to 50,000 (50 to 10,000 for models with 10,000 data points per channel).
Vertical Expansion: 5 x to 50 x depending on the source waveforms.

FUNCTIONS
Identity, negation, integration, differentiation, square, square root, logarithm and exponential (base e and 10), sin x/x, reciprocal and absolute value of any source waveforms.

Number of Input points: 50 to 50,000 (50 to 10,000 for models with 10,000 data points per channel).
Vertical Expansion: 5 x to 50 x depending on the source waveforms.

ENHANCED RESOLUTION
Choice of five low-pass filters for vertical resolution improvement from 8 to 11 bits at reduced bandwidth.

Vertical Expansion: 50 x maximum.
Maximum Sensitivity: 50 mV/div after vertical expansion.

EXTREMA
Logs all extreme values of a waveform over a programmable number of sweeps. Maxima and minima can be displayed together, or separately by choosing ROOF or FLOOR traces.

Number of Sweeps: 1 to 1,000,000.
Number of Input Points: 50 to 50,000 (50 to 10,000 for models with 10,000 data points per channel).

Glitches as short as 0.002% of the time base down to 10 ns are displayed.
Vertical Expansion: 5 x maximum.

CHAINING OF OPERATIONS
Up to four functions can be automatically chained using Functions A, B, C and D. Using memories M1 to M4 for intermediate results, any number of operations can be chained manually or via remote control.

REMOTE CONTROL
All controls and waveform processing functions are fully programmable using the oscilloscope's GPIB or RS-232-C interfaces. Simple English-like commands are used.

STORED FRONT PANELS
Up to four front-panel setups, including WP01 settings, can be stored in resident non-volatile memory and recalled using the menu buttons or via remote control.

9300 WP02

WP02 Spectrum Analysis Firmware for the 9300 Family of Digital Oscilloscopes

Main Features

- Up to 50,000-point FFTs over two or four channels simultaneously
- Frequency range from DC to up to 300 MHz
- Frequency resolution down to 20 μHz
- Up to 10 Gs/s sampling rates
- Frequency domain averaging
- Wide selection of display formats and window functions
- 1,000-point FFTs in less than 0.5 s

Adding the WP02 Spectrum Analysis Package to the 9300 family of digital oscilloscopes provides a fast and economical solution to frequency domain applications.

General

The WP02 Spectrum Analysis Package extends the range of measurement capabilities of the 9300 series of Digital Oscilloscopes. The package is fully programmable over GPIB and RS-232-C interfaces.

Fast Fourier Transforms (FFTs) rapidly convert time domain waveforms into frequency domain records to reveal valuable spectral information such as phase, magnitude and power.

Hardcopies can be directly made on a wide range of printers. As the package is a firmware option which is installed inside the oscilloscope, it eliminates the need for any external controller and is easy to retrofit.

Features and Benefits

LONG RECORD TRANSFORMS
Long record FFTs (up to 10,000 points or up to 50,000 points, depending on the model) provide significant signal-to-noise ratio improvement.

WIDE-BAND FREQUENCY ANALYSIS
DC to up to 300 MHz bandwidth with high resolution.

HIGH SAMPLING RATES
Up to 10 gigasamples/s effectively eliminates aliasing errors.

BROAD SPECTRUM COVERAGE
Up to 25,000 spectral components (5,000 for 10,000-point memory).

MULTI-CHANNEL ANALYSIS
All input channels can be analyzed simultaneously to allow comparison of independent signals for common frequency-domain characteristics.

VERSATILE DISPLAY FORMATS
Frequency-domain data may be presented as magnitude, phase, real, imaginary, complex, log-power and log-PSD (Power Spectral Density). These display formats can all be selected via menu options.

STANDARD WINDOW FUNCTIONS
Rectangular for transient signals; von Hann (Hanning) and Hamming for continuous waveform data; Flattop for accurate amplitude measurements; Blackman-Harris for maximum frequency resolution.

CALIBRATED VERTICAL SCALING
Flattop truncation window provides precisely calibrated vertical scaling for all spectral components.

FREQUENCY DOMAIN AVERAGING
Up to 50,00 FFT results may be averaged to reduce base-line noise and enable analysis of phase-incoherent signals or signals which cannot be triggered on.

TIME-DOMAIN AVERAGING
Averaging real-time signals prior to FFT execution can increase the dynamic range up to 70 dB.

FREQUENCY CURSORS
Cursors give up to 0.004% frequency resolution (up to 0.002% for 10,000 point memory) and measure power or voltage differences to 0.2% of full scale.

CHAINING OF OPERATIONS
Up to four operations can be automatically chained, e.g., Function D=FFT of (CH1 X CH2). Any number of operations can be performed sequentially, either manually or via remote control.

FULL REMOTE CONTROL
All front-panel settings and waveform processing functions are programmable via GPIB or RS-232-C interfaces. Acquired and processed waveforms can be down-loaded to a computer and can later be retrieved and displayed on the oscilloscope.

HARD COPIES
Provides hard copies of the screen using a wide range of printers.

PROCESSING OF EXPANSIONS
Up to four regions of the same waveform, or of different waveforms, can be expanded and processed simultaneously.

FFT ON SEGMENTED WAVEFORMS
Individual waveform segments can be expanded and then analyzed using FFT. Time and date information is automatically recorded for each segment.

FOURIER PROCESSING
Fourier processing is a mathematical technique which enables a time-domain waveform to be described in terms of frequency-domain magnitude and phase, or real and imaginary spectra. It is used, for example, in spectral analysis where a waveform is sampled and digitized, then transformed by a Discrete Fourier Transform (DFT). Fast Fourier Transforms (FFT) are a set of algorithms used to reduce the computation time (by better than a factor of 100 for a 1000 point FFT) needed to evaluate a DFT. The principal advantage of FFT is the speed with which it can analyze large quantities of waveform samples. Using standard measurement techniques, FFT converts a time-domain measurement instrument into a digital spectrum analyzer.

The Spectrum Analysis package enhances the outstanding features of the LeCroy 9300 family. It provides high resolution and wide-band spectrum analysis together with sophisticated window functions and fast processing.

FFT AND LeCROY OSCILLOSCOPES
In FFT mode, LeCroy oscilloscopes provide measurement capabilities superior to those of common swept spectrum analyzers. It is now possible to perform spectral analysis on repetitive and single events at an attractive price. Users can obtain time and frequency values simultaneously and compare phases of the various frequency components with each other.
Rather than the commonly used "power of two" record lengths, the routines used in the WP02 package feature decimal record lengths which can be selected in a 1, 2.5, 5 sequence. Resulting spectra are also calibrated in convenient decimal Hertz values.
The WP02 package is supported by the exceptional acquisition characteristics which are the hallmark of LeCroy oscilloscopes (+2% DC accuracy, high effective bits, improved resolution through averaging). Computations are made using 16-bit processing that allows high accuracy, stability and repeatability.
With LeCroy oscilloscopes, signals may be acquired from up to four acquisition channels and processed simultaneously using up to four functions. This is particularly useful for network characterization or when looking for common frequency-domain characteristics on multiple signals.

IMPROVED RESOLUTION
Fast Fourier Transform calculates equally-spaced frequency components from DC to the full instrument bandwidth. By lowering the sampling rate, it is possible to make measurements with 20 μHz resolution up to 0.5 Hz (Nyquist). By increasing the sampling mode, the widest resolution becomes 100 MHz and the Nyquist frequency 5.0 GHz. This is comfortably above the highest frequency components recordable by the oscilloscope, thus virtually eliminates aliasing effects.

WP02 Specifications

MEMORIES

	9304/10/14	9310M/L and 9314M/L
Acquisition memory/ch (8-bit)	10K points	50K points
Reference memories (16-bit)	4 x 10K points	4 x 50K points
Function memories (16-bit)	4 x 10K points	4 x 50K points

FREQUENCY

		9304/10/14	9310M/L and 9314M/L
Frequency resolution		0.1 mHz to 50 MHz	20 μHz to 100 MHz
Horizontal expansion		100 X	1000 X
Transform size	in	40 to 10000 points	40 to 50000 points
	out	20 to 5000 points	20 to 25000 points

Frequency Range: DC to instrument bandwidth.
Nyquist Frequency Range: 0.5 Hz to 5 GHz.
Frequency Scale Factors: 0.05 Hz/div to 0.2 GHz/div in a 1-2-5 sequence.
Frequency Accuracy: 0.01%.
Selection of the Transform Size: The number of points can be selected in a 1, 2.5, 5 sequence. The transform size defines the decimation applied to the signal after acquisition. It can be adjusted and optimized after signal acquisition and prior to FFT execution.

AMPLITUDE AND PHASE

Amplitude Accuracy: Better than 2%. Amplitude accuracy may be modified by the window function (see the window functions table).
Signal Overflow: A warning is provided at the top of the display when the input signal exceeds the ADC range.
Number of Traces: Time domain and frequency domain data can be displayed simultaneously (up to 4 waveforms).
Phase Range: -180° to +180° .
Phase Accuracy: ±5 (for amplitude > 1.4 div).
Phase Scale Factor: 50° /division.
Zero Baseline: 0 div (center of screen).

SPECTRUM DISPLAY FORMATS AND SCALING

Frequency Scale: Linear, real, imaginary or complex spectrum, in V/div, zero base line at 0 div (center of screen).
Power Spectrum in dBm (1 mW into 50 Ω).
Power Spectral Density (PSD) in dBm.
Phase Display: Linear.
Magnitude Display: Linear. Power and PSD spectra displays have 160 dB range (20 dB/div), continuously expandable up to 0.5 dBm/div.

FREQUENCY DOMAIN POWER AVERAGING

Summation averaging of power, PSD or magnitude for up to 50,000 spectra.

VERTICAL EXPANSION

All spectral formats, up to 50 times, continuously.

DEFINITIONS

Filter Bandwidth at -6 dB characterizes the frequency resolution of the filter.
Highest Side Lobe indicates the reduction in leakage of signal components into neighboring frequency bins.
Scallop Loss is the maximum loss of an equivalent rectangular filter.

WINDOW FUNCTIONS

Rectangular, von Hann (Hanning), Hamming, Flattop and Blackman-Harris. The table below indicates the filter pass-band shape and the resolution.

CURSORS

Absolute (crosshair) and relative (arrow) cursors provide frequency and amplitude (phase, power, power density) measurements. Horizontal bars provide absolute and relative amplitude, (phase, power and power density) measurements.

FFT EXECUTION TIME

100 points in less than 0.05 s.
1000 points in less than 0.5 s.
10000 points in less than 5 s.

REMOTE CONTROL

All WP02 processing functions are fully programmable via the GPIB and RS-232-C interfaces. Simple English-like commands are used.

REMOTE READ AND WRITE

All waveform formats including complex can be read by computer for storage or further processing. Externally generated waveforms can be written into Memories M1 to M4 for FFT or other processing.

STORED FRONT PANELS

Up to 4 front-panel setups, including WP02 menu settings can be stored in non-volatile memory and recalled by the menu buttons at the right side of the screen.

WP02 INSTALLATION

A WP02 package may be retrofitted at any time.

FILTER PASS BAND AND RESOLUTION

Window type	Filter bandwidth at -6 dB [freq. bins]	Highest side lobe [dB]	Scallop loss [dB]	Noise bandwidth [freq. bins]
Rectangular	1.21	-13	3.92	1.0
von Hann	2.00	-32	1.42	1.5
Hamming	1.81	-43	1.78	1.36
Flattop	1.78	-44	0.01	2.96
Blackman-Harris	1.81	-67	1.13	1.71

LeCalsoft–Calibration Software for LeCroy Digital Oscilloscopes

The LeCalsoft package enables a fast and thorough verification of all key specifications.

Main Features

- **Traceability to reference standards**
- **Computer check of key specifications**
- **Computer–aided readjustment**
- **Fully automated configurations available**
- **Supports all 93XX and 94XX models**
- **IBM® PC–AT compatible**

General

The LeCroy LeCalsoft (94XXCS05) test and calibration package provides a convenient, unambiguous check of LeCroy oscilloscopes. Designed for users who require traceability to reference standards (NIST, etc.), this package is ideally suited for use in calibration laboratories where the oscilloscopes are checked at fixed intervals.

Results of the calibration check are fully documented on hard copy, or they can be archived on hard disk or diskette.

LeCalsoft works on any PC compatible with the IBM®–AT standard. It controls the oscilloscope and the calibration sources through a National Instruments® GPIB interface.

Features

Calibration Check

All the essential specifications of the Digital Oscilloscope, such as bandwidth, linearity, noise, trigger, timebase and effective–bit count are tested. Deviations from nominal values are calculated and displayed on the screen, printed, or archived on hard disk or diskette.

Comprehensive Documentation of the Test Results

At the end of each calibration check, two types of documentation are available: a long form printout which gives details of the results of all the tests executed, and states whether or not the results are within the specifications, and a short form printout which gives a summary of the test results.

Calibration Traceable to National Standards (NIST, etc.)

By using signal sources traceable to a standard, the calibration will be traceable to the same standard, provided the relevant documentation is maintained.

Manual and Automated Calibration Check

Both manual operation with computer assistance, and automated operation are possible. Automated operation requires programmable multiplexer and signal sources. See the list of supported devices below.

Assisted Adjustment of the Oscilloscope

A computer–aided adjustment procedure is also provided. By following instructions on the screen, the trained technician is guided through the adjustments required to correct the settings of the oscilloscope so that it is within the specifications.

Calibration Certificate

On request, LeCroy will perform calibration traceable to National Standard Organizations. Calibration certificates are provided as part of this service.

Functional Description

Calibration Practice

LeCroy oscilloscopes are auto–calibrating digital oscilloscopes and therefore do not require regular calibration like analog oscilloscopes. However, for users who require traceability to reference standards (such as those provided by the National Institutes of Standards and Technology), and for calibration laboratories which must inspect incoming instruments and perform recalibration at prescribed intervals, the LeCalsoft computer–aided test and calibration packages provide an easy solution.

Under guidance of the LeCalsoft program, some adjustments to the oscilloscope can be made by an electronics technician. However major deviations from specifications usually require repair by a trained service engineer. LeCroy regularly schedules training classes. If no in–house trained person is available, the nearest LeCroy service center can carry out repairs and calibration, and provide traceability to reference standards.

Using the LeCroy LeCalsoft Packages

For calibration checking, digital oscilloscopes have a great advantage over analog oscilloscopes because waveforms can be transferred to a host computer. This simplifies the calibration procedure enormously, makes it potentially faster and allows an extensive range of tests with unambiguous interpretation of the results.

LeCalsoft performs an extensive series of tests which verify the specifications of the oscilloscope. It includes many tests relevant to analog scopes such as Noise and Linearity tests. Although these tests are difficult and time consuming on an analog oscilloscope, they can be computer controlled and are quickly and easily performed on a digital oscilloscope. Tests which are specific to digital oscilloscopes, such as Sinefit tests are also included.

The various test options in LeCalsoft are presented to the operator in the form of a simple menu system. The user has the choice of performing an automated calibration check of the oscilloscope, or individually testing any of the specifications. Some of the tests require the use of high–quality external signal generators. The user receives instructions on the screen when it is necessary to change the cable connections, but apart from this minor intervention, the tests are fully computer controlled when supported GPIB–programmable instruments are used.

Supported Instrumentation

LeCalsoft software works on any AT–compatible equipped with a math coprocessor and a National Instruments GPIB interface. Automated calibration checking is possible using a set of instruments from the following list. (For an automated calibration check, either the LeCroy or Keithley programmable multiplexer is required to feed the calibration signals to the oscilloscope input.)

RF sinewave generators:
- Marconi 2019A, 2022C, 2030, 2031
- Fluke 6060B, 6061A
- Hewlett–Packard 8642A, 8642B
- Rohde & Schwarz SMX

AF sinewave generators:
- Marconi 2019A, 2022C, 2030, 2031
- Hewlett–Packard 8642A, 8642B
- Rohde & Schwarz SMX
- Tektronix FG5010
- LeCroy AFG 9100

DC Precision Power Supply:
- Tektronix PS5004
- Datron 4708 Autocal Multifunction Standard

Fast Pulse Generator:
- Tektronix CG5001/CG551AP

Power Meters:
- Hewlett–Packard HP436A, HP437B

Multiplexers:
- Keithley 199 SYSTEM DMM/ SCANNER with LeCroy interface board.
- LeCroy 4951, 4973–1, 4973–2 Multiplexers.

Frequency standard:
- WWV or HBG1500

Recommended Accessories

A full kit of calibration connectors and interfaces is available from LeCroy. It includes all the necessary cables, adapters, splitters and filters, as well as the Programmable Multiplexer. Also available is a repair package including special tools, board extenders, etc., for computer–aided adjustment.

Use of Other Instruments

It is possible to perform the calibration check with some other unsupported signal sources. However, the user is then required to set up these instruments manually and to perform one measurement at a time. The LeCalsoft package guides the user step by step, and controls the oscilloscope data acquisition and the computation of the results.

LeCalsoft compares the signal measured by the oscilloscope with the signal it would expect to receive from the generator. Warning messages are displayed whenever tolerances are exceeded. Some of the adjustments may be carried out by the user when the test sequence is finished. In this case, the software will guide the user through the correct adjustment procedure. At the end of the calibration check, a printout can be generated to list the results.

Specifications

Computer Required: Any PC compatible with the IBM–AT standard, and equipped with a mathematical coprocessor and a National Instrument Inc. GPIB interface.

Operating System: DOS 3.0 upward

Medium: $3^1/_2$" 1.44 Mb
$5^1/_4$" 1.2 Mb diskette

Major Tests Supported by LeCalsoft

Internal

To ensure proper calibration of the oscilloscope, internal auto–calibration tests are automatically executed during normal operation. This standard sequence of internal auto calibration tests is initiated by the software and the results are transferred to the PC for analysis.

The tests are:

- Calibration of the resolution of the time–to–digital converter with respect to the system clock
- Determination of the gain constants of the input amplifiers
- Offset compensation versus gain variation
- Global internal non–linearity
- General functionality check

Bandwidth

To calculate the bandwidth, the amplitudes of sine waves of increasing frequencies are measured. The sine wave generator is first set to 500 kHz with an amplitude 75% of full screen, i.e. ±3 vertical divisions. The frequency is then swept up to the point where an amplitude drop of 3 dB is observed. This indicates the bandwidth.

This test is executed on all channels for 1 MΩ and 50 Ω input impedance and for all vertical sensitivities. It requires a sine wave generator with good flatness.

Generators supported under program control are listed on page 2.

Linearity

15 different known voltages, varying from 5% to 95% of full screen, are applied by the external voltage reference source. For each voltage value, a full waveform is acquired, and the mean value is compared to the known input voltage. The linearity is determined through a linear regression fit to the 15 measurements.The slope, the offset and the chi–square of the fit are computed.

With the linearity test, many other related tests are performed: response time of the overload protection of the 50 Ω input, linearity of the variable gain calibration, range and linearity of the offset setting, and quality of the input coupling.

This procedure is executed on all channels for both 1 MΩ and 50 Ω input impedance. The test requires a DC source with a precision and time stability of 0.1%, a voltage range of 0 V to 20 V adjustable in steps of 5 mV, and an output current capability of 300 mA.

Power supplies supported under program control are listed on page 2.

Noise

The noise tests are executed on all channels for both 1MΩ and 50 Ω input impedance, with AC and DC coupling, five different time–base settings, and open inputs. Full waveforms are acquired with different offset values. The peak–to–peak as well as the RMS values of each measurement are computed, and the maximum values are recorded. The program also indicates the occurrence of any "flyers", i.e. short noise peaks generated by the ADC's.

The noise tests also include:

- checking the linearity of the variable offsets of all channels between 2.5% and 97.5% of full screen.
- checking the stability of the ground line when switching the inputs between GROUND and DC coupling modes.

Rise time/Overshoot

Executed on all channels for both 1MΩ and 50 Ω input impedance, these tests measure the rise time of the oscilloscope response to the input voltage step, as well as the amount of pre–shoot and overshoot. They require a voltage step generator with calibrated fast rise–time amplitude.

The Voltage Step Generator supported under program control is the Tektronix CG5001.

Sinefit

The performance of the analog–to–digital converter is evaluated in terms of the number of effective bits (a measure of the signal–to–noise ratio). It is measured on all channels, at a sensitivity of 50 mV/div., by applying a pure sine wave at varying frequencies and timebase settings

This test is a measurement of dynamic linearity. It shows the effect of such errors as noise, non–linearities and aperture jitter.

Timebase

The timebase test compares the internal clock with a very precise and stable external timebase reference (clock generator) such as the WWV standard or HBG 1500.

Trigger

The trigger capabilities are tested for all possible configurations. These include:

- Internal and external trigger sources
- DC, AC, HF–reject, and LF–reject couplings
- Trigger level settings in all slope modes.

ORDERING INFORMATION

LeCalsoft and Options

94XXCS05	Complete LeCalsoft for 93XX and 94XX (software and hardware), incl. cables, switch card, adapters, etc.
94XXCS01	LeCalsoft software for 93XX and 94XX
9400CS01	Calsoft software for 9400A

LeCalsoft Accessories

93XXKCS02	Calibration kit for 93XX and 94XX
9400KCS02	Calibration kit for 9400A

Individual system components available on request

U.S. REGIONAL SALES OFFICES 1 800–5–LeCroy (1–800–553–2769):

automatically connects you to your local sales office.

LeCroy has sales engineers in most major metropolitan areas, coordinated through a system of five Regional Sales and Service Offices:

NORTHEAST: 700 Chestnut Ridge Rd, Chestnut Ridge, NY 10977

SOUTHEAST: 410 Ware Blvd Ste 716, Tampa, FL 33619

FARWEST: 5912 Stoneridge Mall Rd Ste 150, Pleasanton, CA 94588

CENTRAL:

Midwest: 4811 S 76th St Ste 415, Greenfield, WI 53220

Southwest: 14800 Central Ave SE Albuquerque, NM 87123

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Austria: Dewetron GmbH, (0316) 391804
Benelux: LeCroy BV (0031) 4902–89285
Brazil: ATP–Hi–Tek, (011) 421–5477
Canada: LeCroy Canada Inc, (514) 928–4707
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France: LeCroy Sarl (1) 69 073 897
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Greece: Hellenic S/R Ltd., (01) 721 1140
Hong Kong: Euro Tech (Far East) Ltd, (052) 814–0311
India: Electronic Ent, (022) 4137096
Israel: Ammo, (03) 453157
Italy: LeCroy Srl, Roma (06) 300.97.00 or 331 31 46; Milano (02) 2940 5634
Japan: LeCroy Japan, Tokyo (0081) 33 376 9400; Osaka (0081) 6 330 0961
Korea: WOOJOO Hi–Tech Corp, (02) 449–5472
Mexico: Nucleoelectronica SA, (05) 5593 6043
New Zealand: E.C. Gough Ltd, (03) 798–740
Norway: Avantec AS (02) 630520
Pakistan: Electronuclear Corp, (021) 418087
Portugal: M.T. Brandao, Lta, (02) 815680
Singapore: Sing. Electr. and Eng. Ltd (65) 481–8888
S. Africa: Westplex Test & Meas. (011) 787 0473
Sweden: MSS AB, (0764) 68100
Switzerland: LeCroy SA (064) 51 91 81
Taiwan: Topward El.Inst., Ltd, (02) 601 8801
Thailand: Measuretronix Ltd, (02) 374 2516
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LeCroy

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TDS 011/004

9310/9310M/9310L

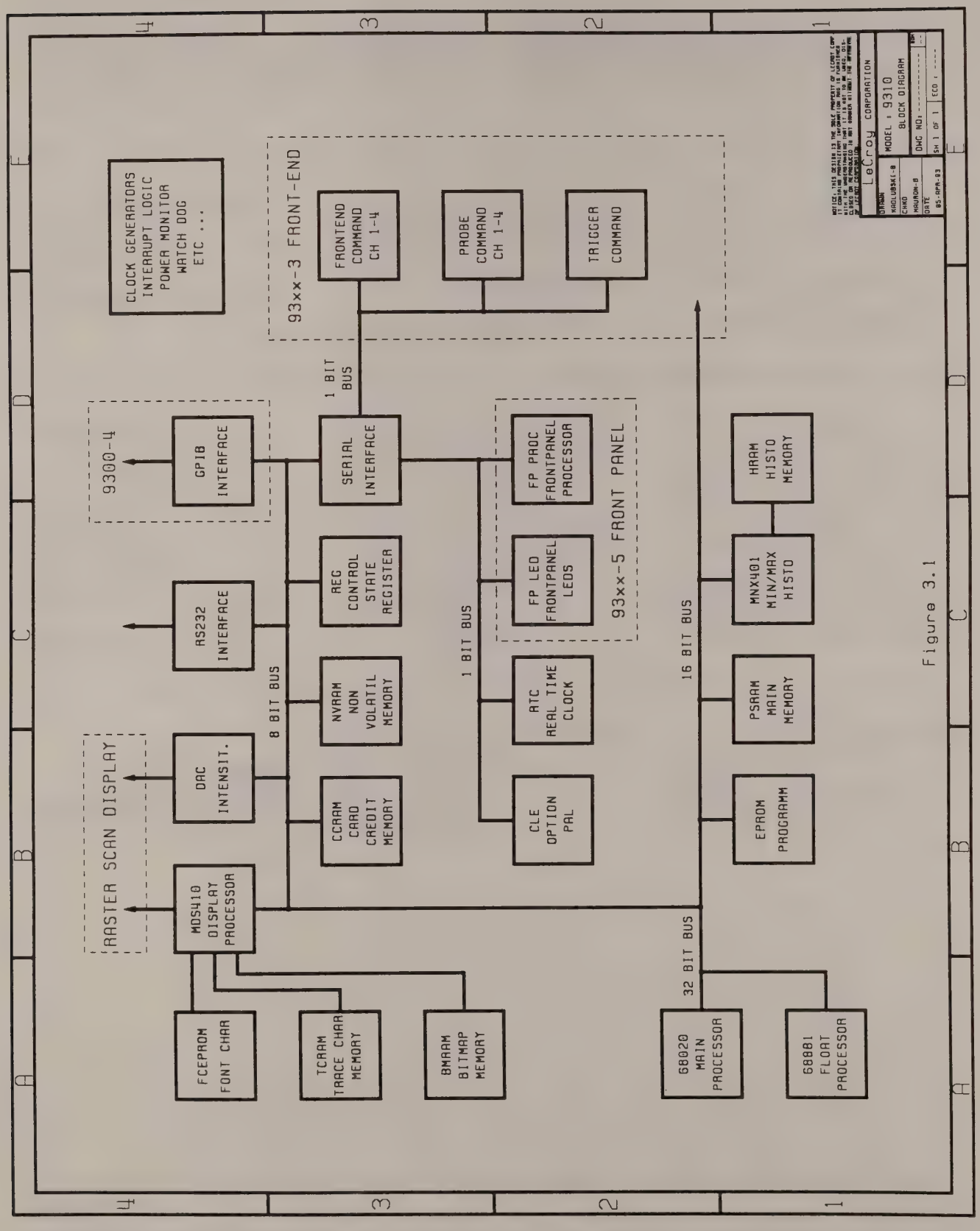

CLOCK GENERATORS
INTERRUPT LOGIC
POWER MONITOR
WATCH DOG
ETC ...
93xx-3 FRONT-END
FRONTEND COMMAND CH 1-4
PROBE COMMAND CH 1-4
TRIGGER COMMAND
1 BIT BUS
9300-4
GPIB INTERFACE
SERIAL INTERFACE
FP PROC FRONTPANEL PROCESSOR
HRAM HISTO MEMORY
REG CONTROL STATE REGISTER
FP LED FRONTPANEL LEDS
93xx-5 FRONT PANEL
RS232 INTERFACE
1 BIT BUS
16 BIT BUS
MNX401 MIN/MAX HISTO
8 BIT BUS
NVRAM NON VOLATIL MEMORY
ATC REAL TIME CLOCK
PSRAM MAIN MEMORY
RASTER SCAN DISPLAY
DAC INTENSIT.
CCRAM CARD CREDIT MEMORY
CLE OPTION PAL
EPROM PROGRAMM
MDS410 DISPLAY PROCESSOR
32 BIT BUS
FCEPROM FONT CHAR
TCRAM TRACE CHAR MEMORY
BMRAM BITMAP MEMORY
68020 MAIN PROCESSOR
68881 FLOAT PROCESSOR
LeCroy CORPORATION
MODEL : 9310
BLOCK DIAGRAM
DWG NO:
SH 1 OF 1
ECO :
05-APR-83
A
B
C
D
E
1
2
3
4

Figure 3.1

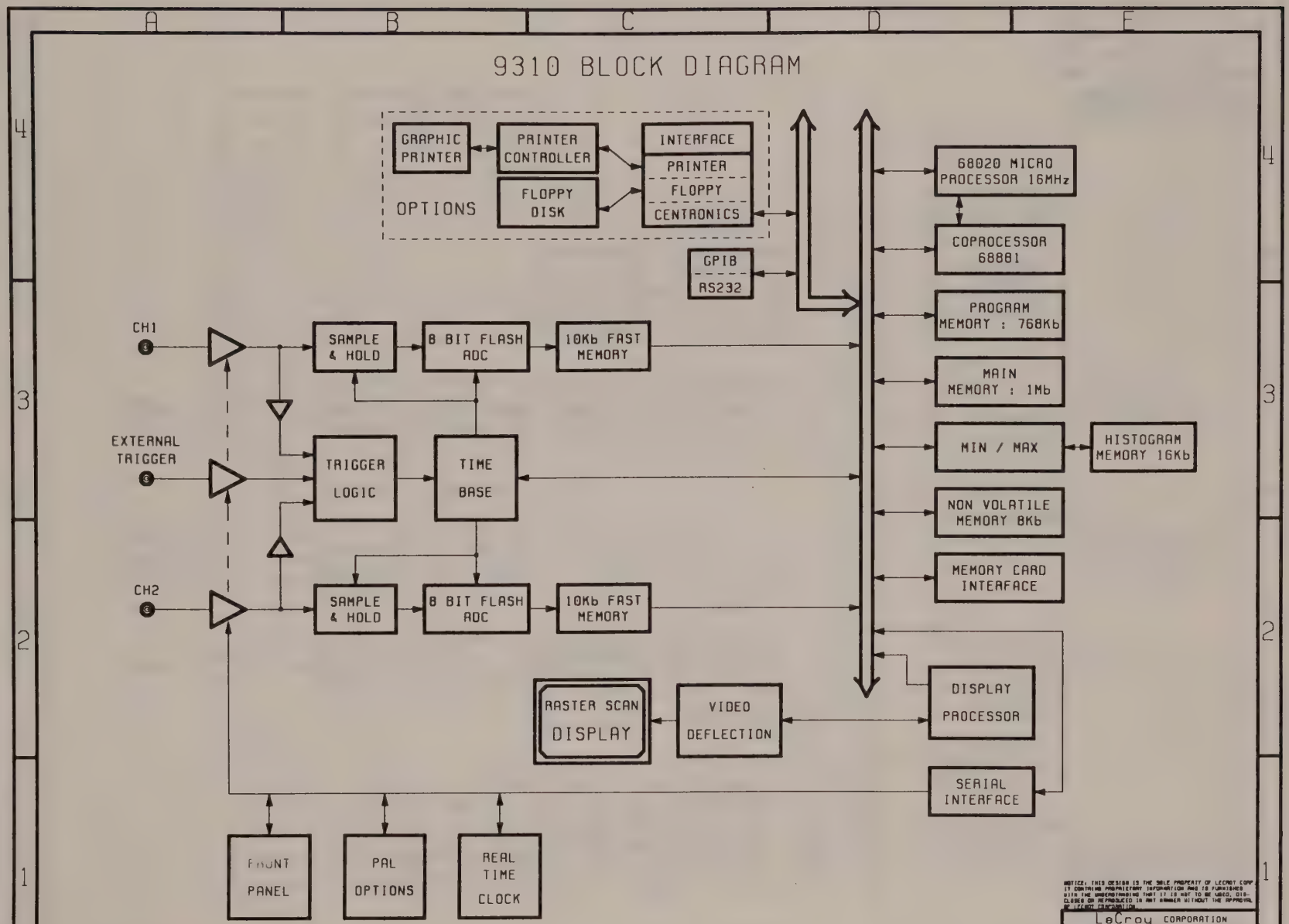

9310 BLOCK DIAGRAM
GRAPHIC PRINTER
PRINTER CONTROLLER
FLOPPY DISK
OPTIONS
INTERFACE
PRINTER
FLOPPY
CENTRONICS
GPIB
RS232
68020 MICRO PROCESSOR 16MHz
COPROCESSOR 68881
PROGRAM MEMORY : 768Kb
MAIN MEMORY : 1Mb
MIN / MAX
HISTOGRAM MEMORY 16Kb
NON VOLATILE MEMORY 8Kb
MEMORY CARD INTERFACE
DISPLAY PROCESSOR
SERIAL INTERFACE
CH1
SAMPLE & HOLD
8 BIT FLASH ADC
10Kb FAST MEMORY
EXTERNAL TRIGGER
TRIGGER LOGIC
TIME BASE
CH2
SAMPLE & HOLD
8 BIT FLASH ADC
10Kb FAST MEMORY
RASTER SCAN DISPLAY
VIDEO DEFLECTION
FRONT PANEL
PAL OPTIONS
REAL TIME CLOCK
LeCroy CORPORATION
MODEL : 9310
BLOCK DIAGRAM

Figure 3.2

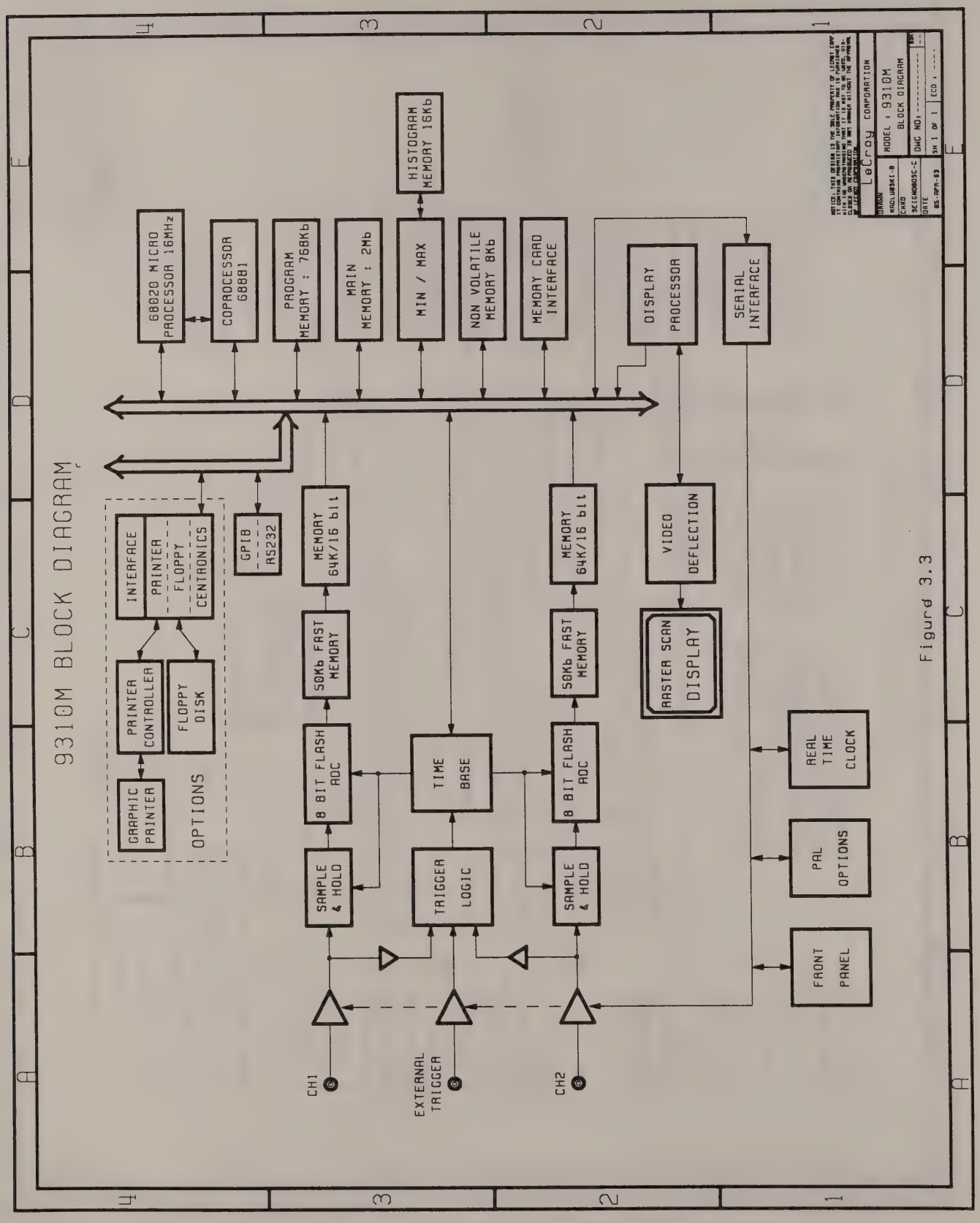

9310M BLOCK DIAGRAM
68020 MICRO PROCESSOR 16MHz
COPROCESSOR 68881
PROGRAM MEMORY : 768Kb
MAIN MEMORY : 2Mb
MIN / MAX
HISTOGRAM MEMORY 16Kb
NON VOLATILE MEMORY 8Kb
MEMORY CARD INTERFACE
DISPLAY PROCESSOR
SERIAL INTERFACE
MEMORY 64K/16 bit
MEMORY 64K/16 bit
VIDEO DEFLECTION
RASTER SCAN DISPLAY
50Kb FAST MEMORY
50Kb FAST MEMORY
8 BIT FLASH ADC
8 BIT FLASH ADC
TIME BASE
SAMPLE & HOLD
SAMPLE & HOLD
TRIGGER LOGIC
REAL TIME CLOCK
PAL OPTIONS
FRONT PANEL
CH1
EXTERNAL TRIGGER
CH2
GPIB RS232
INTERFACE
PRINTER
FLOPPY
CENTRONICS
PRINTER CONTROLLER
FLOPPY DISK
GRAPHIC PRINTER
OPTIONS
LeCroy CORPORATION
MODEL : 9310M
BLOCK DIAGRAM

Figure 3.3

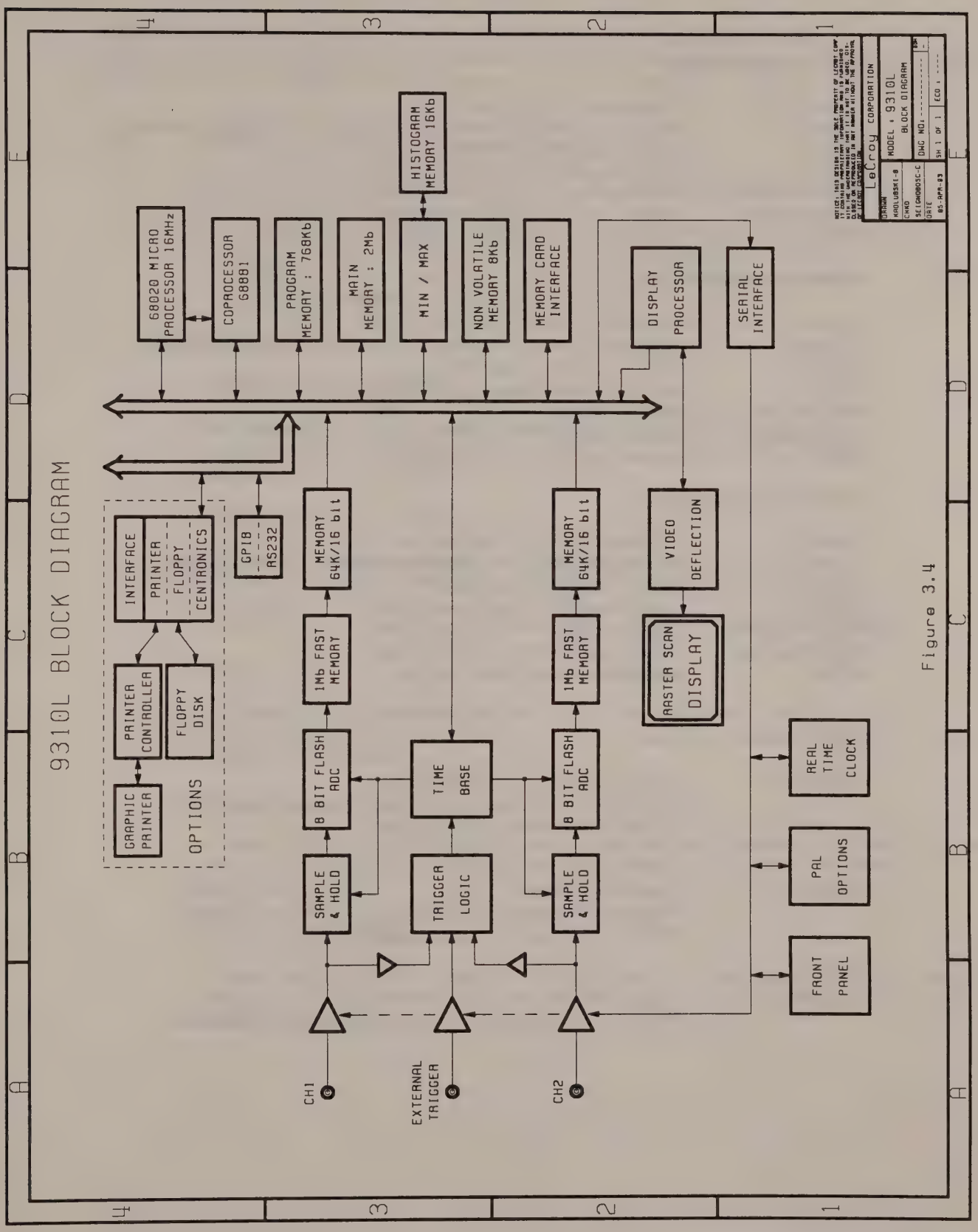

9310L BLOCK DIAGRAM
68020 MICRO PROCESSOR 16MHz
COPROCESSOR 68881
PROGRAM MEMORY : 768Kb
MAIN MEMORY : 2Mb
HISTOGRAM MEMORY 16Kb
MIN / MAX
NON VOLATILE MEMORY 8Kb
MEMORY CARD INTERFACE
DISPLAY PROCESSOR
SERIAL INTERFACE
INTERFACE
PRINTER FLOPPY CENTRONICS
GPIB RS232
MEMORY 64K/16 bit
1Mb FAST MEMORY
8 BIT FLASH ADC
SAMPLE & HOLD
TIME BASE
TRIGGER LOGIC
VIDEO DEFLECTION
RASTER SCAN DISPLAY
REAL TIME CLOCK
PAL OPTIONS
FRONT PANEL
PRINTER CONTROLLER
FLOPPY DISK
GRAPHIC PRINTER
OPTIONS
CH1
EXTERNAL TRIGGER
CH2
LeCroy CORPORATION
MODEL : 9310L
BLOCK DIAGRAM

Figure 3.4

3.5 9310 Sub-Assemblies

F9300-1	Processor with 1 Mbyte RAM
F9310-3	Main card, dual channel, 100 Ms/s, 10 Kbytes memory
F9300-4	GPIB + RS232 interface
F9310-5	Dual channel front panel 9310
93XX-PS1715	Power supply +/- 5V, +/- 15V.
93XX-Display	Video, deflection, CRT, yoke
M93XX	Mechanical for 93XX series

3.6 9310M Sub-Assemblies

F9314M-1	Processor with 2 Mbytes RAM
F9310M-3	Main card, dual channel, 100 Ms/s, 50 Kbytes memory
F9300-4	GPIB + RS232 interface
F9310-5	Dual channel front panel 9310
93XX-PS1715	Power supply +/- 5V, +/- 15V.
93XX-Display	Video, deflection, CRT, yoke
M93XX	Mechanical for 93XX series

3.7 9310L Sub-Assemblies

F9314M-1	Processor with 2 Mbytes RAM
F9310L-3	Main card, dual channel, 100 Ms/s, 1 Mbyte memory
F9300-4	GPIB + RS232 interface
F9310-5	Dual channel front panel 9310
93XX-PS1715	Power supply +/- 5V, +/- 15V.
93XX-Display	Video, deflection, CRT, yoke
M93XX	Mechanical for 93XX series

3.8 9310 Hardware Options

93XX-FDGP	Graphic Printer & Floppy Disk F9300-6 : Centronics, Floppy, Printer interface F9300-7 : Printer controller
93XX-GP01	Graphic Printer F9300-6 : Centronics, Floppy, Printer interface F9300-7 : Printer controller
93XX-FD01	Floppy Disk F9300-6 : Centronics, Floppy, Printer interface

4.1 F9300-1 or F9314M-1 Processor Board

The processor board is based on to the 68020 and 68881 coprocessor, with a clock frequency of 16 MHz.
The internal Data Bus is 32 bits wide, the peripherals Data Bus 8 or 16 bits, and the Address Bus has 27 bits (A0-A25 and A31).
Depending of the scope configuration, two versions are used:

1 Mbyte memory : F9300-1 (9310, 9314)
2 Mbytes memory : F9314M-1 (9310M/L, 9314M/L)

The board contains the following sections:

Program memory (EPROM)

768 Kbytes: 2 x 2 Mbit Eproms and 2 x 1 Mbit Eproms.
Data Bus : 16 bits.
Address : 0000 0000 to 000D FFFE.

Working memory (PS RAM)

F9300-1, 1 Mbyte memory : 2 Pseudo static RAM of 4 Mbit.
F9314M-1, 2 Mbytes memory : 4 Pseudo static RAM of 4 Mbit.
Data Bus : 16 Bits.
Address : 0040 0000 to 004F FFFE or 005F FFFE.

Memory card

An interface is implemented to support an external memory card.
From 16 Kbytes to 512 Kbytes.
Data bus: 8 bits.

Non volatile memory

A static RAM of 8 Kbytes contains the default parameters used during power on to initialize the scope. This memory is battery backed up.
Data bus: 8 bits.

Min/Max calculation

A gate array MNX401 makes a histogram in its associated 16 Kbytes memory by using the minima and maxima.
Data bus: 16 bits.

Graphic processor

The graphic processor of the raster scan display is a gate array designated MDS410.

- Clock frequency : 48 MHz.
- Trace and characters memory : 32 Kbytes (CTRAM).
- Bitmap memory : 40 Kbytes (BMRAM).
- Character font EPROM : 32 Kbytes (FCRAM).
- Data bus : 8 bits.

DAC command of the display intensity

The command of the RAMDAC is done by a 8 bits RAMDAC.

Status and command registers

Status (read) and command (write) registers control the memory card and front panel interface during the boot or after a RESET.

External interfaces

Serial RS232 interface
Parallel GPIB interface
See F9300-4 Description Section 4.3

Optional interfaces

Graphic Printer : F9300-6 interface and F9300-7 controller
Floppy Disk Drive : F9300-6 interface
Centronics : F9300-6 interface

Serial peripherals

The processor controls the digital and analog section with a double serial controller.

- DAC's registers (read/write).
- Front panel registers (68HC05C4).
- RTC registers (68HC68T1).
- Probe detection.
- Software options (GAL).
- Front end control.
- Trigger control (MTR408).

Real time clock

Integrated circuit 68HC68T1 (Motorola or RCA).

- Resolution : 1 sec to 99 years.
- Clock frequency : 32.768 KHz.
- Non volatile memory : 32 Kbytes.
- Data and Address bus : 8 bits.
- Interrupt level : 5.

4.2 F9310/M/L-3 Main Board

4.2.1 Introduction

The board is divided into seven parts:

- Microprocessor control.
- Front end control.
- Trigger control.
- Channel 1, Channel 2 front ends.
- Channel 1, Channel 2 ADC's.
- Time base.

4.2.2 Front End

4.2.2.1 Serial Commands of Gain and Coupling

Send by the processor in a 16 bits word.
Address: Channel 1 0141 2000
Channel 2 0141 3000

MSB

CAL/IN	:20/*1	2mV	10mV	20mV	50mV	100mV	ADC	_ADC	BWL	MTR2	MTR1	OF:10	AC/DC

HZ/50	LSB

RANGE	CONTROL BITS										GAIN to ADC
	ADC	_ADC	OF:10	:20/*1	2mV	5mV	10mV	20mV	50mV	100mV	
2mV	0	1	1	1	1	0	0	0	0	0	20
5mV	0	1	1	1	0	1	0	0	0	0	8
10mV	0	1	1	1	0	0	1	0	0	0	4
20mV	1	0	0	1	0	0	0	1	0	0	-2
50mV	1	0	0	1	0	0	0	0	1	0	-0.8
100mV	1	0	0	1	0	0	0	0	0	1	-0.4
200mV	0	1	1	0	0	0	1	0	0	0	0.2
500mV	1	0	0	0	0	0	0	1	0	0	-0.08
1 V	1	0	0	0	0	0	0	0	1	0	-0.04
2 V	1	0	0	0	0	0	0	0	0	1	-0.02

CAL/IN 0 = CAL coupling
:20/*1 0 = attenuator is "on"
x mV 1 = range enable
ADC 1 = to invert signal (seven lsb's = LINV)
_ADC 0 = " " " (sign, msb = MINV)
BWL 1 = bandwidth limit on

MTR2 0 = no coupling on MTR2
MTR1 0 = no coupling on MTR1
OF:10 0 = offset gain for 20mV to 5V range (x1)
AC/DC 0 = AC coupling
HZ/50 0 = HIGH Z coupling

4.2.2.2 Serial Commands of Trigger Coupling and Calibration

Address 0141 4000

MSB

CAL:10	TBWL2	HFREJ2	AC2	DC2	IMTR2	SNEG2	SPOS2	SEXTCK	TBWL1	HFREJ1	AC1	DC1
MTR2								MTR1				

IMTR1	SNEG1	SPOS1

LSB

For MTR2 and MTR1: DC, AC, HFREJ, TBWL

	INPUT FILTER SEL.				THRESHOLD INTERNAL/2	OUTPUTS
COUPLING	TBWL	HFR	AC	DC		
DC	0	0	0	1	NON INVERTED	NON INVERTED
DC + BWL	1	0	0	0	"	"
AC	0	0	1	1	"	"
AC + BWL	1	0	1	0	"	"
LFREJ	0	1	0	1	"	"
LFR + BWL	1	1	0	0	"	"
HFREJ	0	1	0	0	INVERTED	INVERTED
NO COUPL.	0	0	0	0		

SNEG
SPOS

OUTPUTS TRIGGER	SNEG	SPOS
POSITIVE SLOPE	0	1
NEGATIVE SLOPE	1	0
DIVIDER BY 2	1	1

RANGE 20 mV TO 1 Volt

CAL:10 1 = divide by 4 0 = divide by 40 to calibrate

SEXTCK 1 = select external clock and disable interpolator

HIBW 1 = Direct high frequency input enable

IMTR1 0 = for MTR1 offset calibration or external trigger source

IMTR2 0 = for MTR2 offset calibration or external trigger source

4.2.2.3 Serial Commands of External Trigger and TV Trigger

Address 0141 5000

MSB

TVINV	MTR2	MTR1	TEXT:10	HDTV	875	MB	MA	_STI	_STW	SVS	STS	TSEL3	TSEL2

TSEL1	TSEL0	LSB

TVINV 0 = inverting

MTR2 0 = no coupling on MTR2

MTR1 0 = no coupling on MTR1

TEXT:10 0 = 20 dB attenuator is "on"

HDTV
875

HDTV	1	1	0	0
875	1	0	1	0
SET	HDTV	1225	875	525-625

MB
MA

MB	0	0	1	1
MA	0	1	0	1
SET ON TV2 ON TV1	LINE LINE	CSO X	CSO OE	CSO VSO

_STI 0 = trigger on interval width mode
_STW 0 = trigger on pulse width mode

SVS 0 = enable TV1 multiplexer
STS 0 = enable TV2 multiplexer

TSEL3
TSEL2 trigger selection
TSEL1
TSEL0

4.2.2.4 Overload

The overload reading is done in two steps:
- Read the byte at address 0140 5000. If MSB=1 an overload is detected.
- Read the byte at address 0140 4000.

MSB LSB

												OVL CH4	OVL CH3	OVL CH2	OVL CH1
-	-	-	-	-	-	-	-	-	-	-	-				

OVL : CH1 = 1 Overload channel 1 CH2 = 1 Overload channel 2

4.2.2.5 Analog Control

The analog controls are sent from a 16 bits DAC, multiplexed in 12 Sample & Hold, and refreshed every 512 µsec.
The DAC range is +/- 10 V.

DAC 0000 = +10 V
DAC 7FFF = 0 V
DAC FFFF = -10 V

Channel 1		Channel 2
0300 0008	VAR.GAIN (IVG1)	0300 000C
0300 0048		0300 004C
0300 000A	OFFSET	0300 000E
0300 004A		0300 004E

IVG1 = 7.4 - DAC/20 mA

OFFSET = - DAC/5.4 2 mV to 10 mV

= + DAC/5.4 20 mV to 100mV

Trigger

0300 0010 VTH MTR1 TRIG level
0300 0050
0300 0012 VTH MTR2 VAL level
0300 0052

VTH = DAC/20

Calibration

0300 0014 Calibration
0300 0054

CAL OUT = DAC/Attenuator factor

4.2.3 ADC

Depending on the 9310 model, the ADC has the following configuration:

DSO model	Board	ADC Memory	Buffer Memory
9310	F9310-3	10 Kbytes	no
9310M	F9310M-3	50 Kbytes	64 K/16bits
9310L	F9310L-3	1 Mbytes	64 K/16bits

Each channel has an ADC section with Sample & Hold (HSH410), 8 bits FLASH ADC converter, and acquisition memory.

Address:
0280 0000 ADC memory channel 1
02A0 0000 Buffer memory channel 1 *
02C0 0000 ADC memory channel 2
02E0 0000 Buffer memory channel 2 *

* Not for 9310 scope

The MIN/MAX calculation is done by the MNX401 on the processor board.

4.2.4 Time Base

- 100 Ms/s sampling frequency.
- 1 Mbytes acquisition memory addressing.
- 70 ns acquisition memories in two blocks.
- 10 ps resolution SMD interpolator.
- 400 MHz START/STOP oscillator for the "Trigger width" and "Trigger on interval" modes.
- SMART trigger with window capability.
- Real time TDC measuring the trigger time position.

4.3 F9300-4 GPIB and RS 232 Interface

This board is connected to the processor F9300-1 or F9314M-1 through a flat cable . Data bus is 8 bits, address bus: 12 bits.
Address 0180 000 to 0180 00FF.

4.3.1 RS 232 Serial Interface

Based on the 2661A IC from Signetics or Philips.

- Clock frequency 4.9152 MHz.
- 4 internal registers of 8 bits.
- Interrupt level 2.
- Connector type DB9 with 9 male pins.

4.3.2 GPIB Interface

Based on the circuit 7210 IC from NEC.

- Clock frequency 5 MHz.
- 8 internal registers of 8 bits.
- Tri-state external GPIB drivers.
- Low level output.
- Interrupt level 3.

The GPIB address is set by software and stored in non-volatile memory.

4.4 F9310-5 Front Panel

The front panel is connected to the processor board with a flat cable. Power supply and control signals are supplied from the processor. The front panel is divided in two sections:

- One board with Motorola 68HC05C4 processor, coders, and serial data interface.

- One matrix Keyboard with push buttons.

4.5 F9300-6 Centronics, Floppy, Printer interface option

4.5.1 Centronics interface option

This Centronics interface makes direct connection possible to external parallel printer.

- Address 0130 0180 to 0130 01A0
- Interrupt level 2

4.5.2 Floppy Disk drive interface option

Based on the circuit MCS3201 from Motorola.

- Address 0130 01C0 to 0130 01C7
- Interrupt level 4

Address	Read	Write
0130 01C0	Input register	-----
0130 01C2	-----	Digital output register
0130 01C4	Main status register	-----
0130 01C5	Data register	Data register
0130 01C7	Data input register	Disk control register

4.5.3 Printer Interface option

Internal graphic printer : Seiko LPT5446

- Address 0130 0140 to 0130 0160
- Interrupt level 2

4.6 F9300-7 Printer Controller option

Based on the LPT5000 series control chip set from Seiko instrument Inc

- PT501P01 CPU
- PT500GA1 Gate array
  Technical reference 39019-2234-01

- Address 0130 0100

4.7 93XX-Display

4.7.1 General Description

The raster scan display module is divided into five sections:

- Graphic processor
- Deflection
- Video
- Yoke
- Cathode ray tube

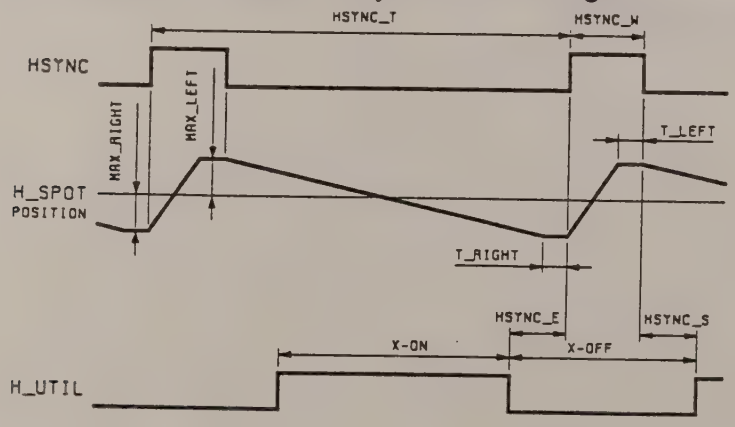
4.7.2 Basic Characteristics

- Nine inches diagonal monochrome, yellowish, orange.
- CRT anti-glare treated
- Non interlaced resolution of (X)810 x (Y)696 pixels at 60 Hz frequency.
- Landscape vertical raster
- Electromagnetic deflection.
- Intensity control rise and fall time > 12 ns.
- Analog intensity input
- TTL synchronization input.
- Horizontal nominal size: 165 mm for X-on = 15.39 Ms.
- Horizontal size adjustment: > +/- 5 mm.
- Horizontal offset adjustment: +/- 5 mm.
- Vertical nominal size: 120 mm for Y-on = 14.5µs.
- Vertical size adjustment: > +/- 5 mm.
- Vertical offset adjustment: +/- 5 mm.
- X and Y differential non linearity: 10%.

The line deflection is vertical, from bottom to top. The field deflection is horizontal, from left to right and is resynchronized to the power line frequency.

4.7.3 Horizontal Deflection

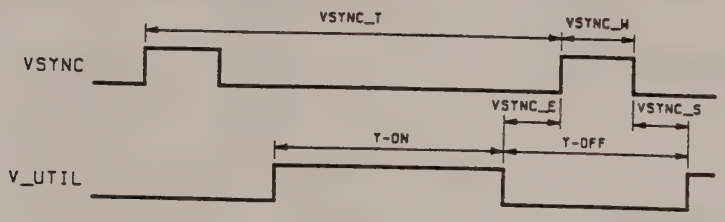
The horizontal deflection is synchronized to the 50 or 60 Hertz power line frequency. The on time display is the same for both frequencies, therefore the deflection is calculated for 60 Hz. The horizontal deflection is controlled by the HSYNC signal.



The trailing edge of HSYNC resets the horizontal spot position to a hardware predefined position at the left side of the screen: MAX_left. When ever HSYNC is high, the spot stays at this position.
The falling edge of HSYNC starts the horizontal deflection ramp. The ramp has the same rate for either 50 or 60 Hertz frequency.
When ever HSYNC is low, the horizontal deflection will rise left to right, until HSYNC becomes high, or the system has reached the maximum right position (MAX_RIGHT).

4.7.4 Vertical Synchronization

The whole timing of both VSYNC and HSYNC is synchronized to the pixel clock (PCLK).
The pixel rate is 48 MHz.



4.7.5 Horizontal and Vertical Resolution

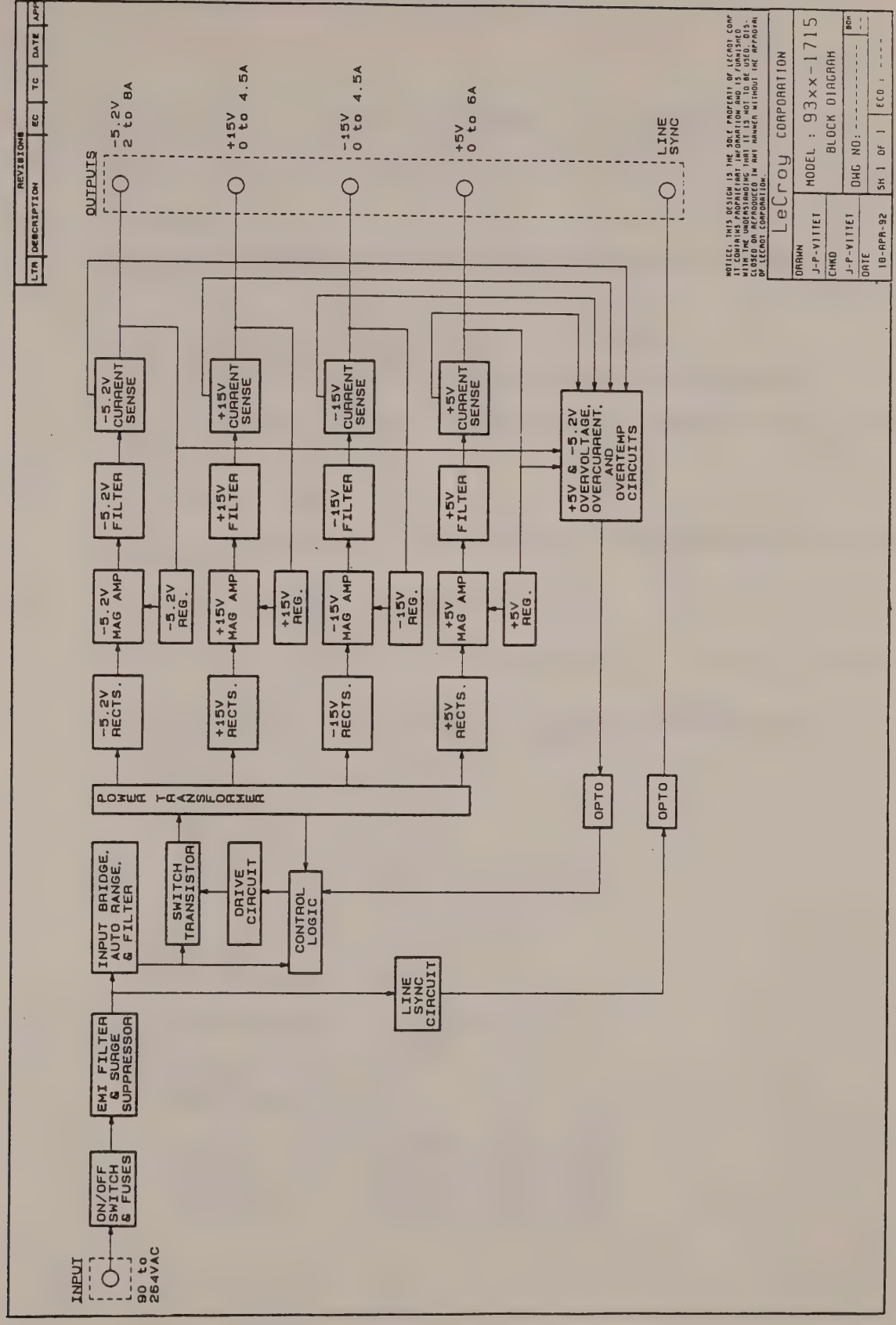
	# OF V-LINE	TIME in ms
HSYNC_T	842	15.998
HSYNC_W	22	0.418
HSYNC_E	4	0.076
HSYNC_S	6	0.114
X-ON	810	15.390
X-OFF	32	0.608

Values for the horizontal timing for the maximum field refresh frequency.
Vertical timing.

	# OF PIXELS	TIME in us
VSYNC_T	912	19.000
VSYNC_W	136	2.833
VSYNC_E	0	0.000
VSYNC_S	80	1.666
Y-ON	696	14.500
Y-OFF	216	4.500

4.8 93XX-PS1715 Power Supply Specifications

Input voltage	: 90 to 132 V or 180 to 250 V. Auto ranging line voltage.
Input frequency	: 45 Hz to 66 Hz.
Input rush current	: Max 40 A peak at start up.
Environmental	: Operating temperature range 0° to $55^{o}C$ Storage temperature range -20° to $85^{o}C$ Relative humidity from 5% to 95%.
Shock vibration	: MIL-STD-810D MIL-T-28000C paragraph 4.5.5.4.2
Output voltages	: - 5.2 Vdc, 8 amp Max. + 5.2 Vdc, 4.5 amp Max. -15.1 Vdc, 4.5 amp Max +15.1 Vdc, 4.5 amp Max.
Output adjustment	: +/- 5%.
Regulation	: +/- 1%.
Transient response	: -5.2 V < 400 mV. +5.2 V < 250 mV. +/- 15.1 V < 1.5 V. Maximum recovery time 1.5 msec.
Ripple and noise	: Peak to peak value < 1%. Line frequency rejection < 5 mV.
Overshoot	: < 5% at start up.
Hold up time	: 20 msec.
Output short circuit protection	: Yes.
Output overvoltage protection	: No.
Input protection	: 5 amp fuses.
Thermal protection	: Yes.
Safety	: VDE 0806, IEC 380, UL478, CSAC22.2#154
EMI	: VDE 0871 class B, FCC 20780 part 15j class B.
MTBF	: 80.000 hours.


INPUT
90 to 264VAC
ON/OFF SWITCH & FUSES
EMI FILTER & SURGE SUPPRESSOR
INPUT BRIDGE, AUTO RANGE, & FILTER
SWITCH TRANSISTOR
DRIVE CIRCUIT
CONTROL LOGIC
POWER TRANSFORMER
LINE SYNC CIRCUIT
-5.2V RECTS.
+15V RECTS.
-15V RECTS.
+5V RECTS.
-5.2V MAG AMP
-5.2V REG.
+15V MAG AMP
+15V REG.
-15V MAG AMP
-15V REG.
+5V MAG AMP
+5V REG.
-5.2V FILTER
+15V FILTER
-15V FILTER
+5V FILTER
-5.2V CURRENT SENSE
+15V CURRENT SENSE
-15V CURRENT SENSE
+5V CURRENT SENSE
+5V & -5.2V OVERVOLTAGE, OVERCURRENT, AND OVERTEMP CIRCUITS
OPTO
OPTO
OUTPUTS
-5.2V 2 to 8A
+15V 0 to 4.5A
-15V 0 to 4.5A
+5V 0 to 6A
LINE SYNC
REVISIONS
LTR
DESCRIPTION
EC
TC
DATE
APP
LeCroy CORPORATION
DRAWN
J-P-VITTET
CHKD
J-P-VITTET
DATE
10-APR-92
MODEL : 93xx-1715
BLOCK DIAGRAM
DWG NO: ----------
SH 1 OF 1
ECO : ----
BOM
--

5.1 Turn On

Switch on the power using the power switch on the rear panel.
Check:

That the display turns on after about 10 seconds.
That the display is stable.
That the range of intensity and grid intensity is reasonable.

Wait for about 10 minutes for the scope to reach a stable operating temperature.

5.2 Noise on the Inputs

This is to verify the proper operation of the main board (front end, ADC's, TDC).

5.2.1 Channel 1, Channel 2 : 1 MOhm DC

With no signal connected to the inputs, set up the DSO as follows:

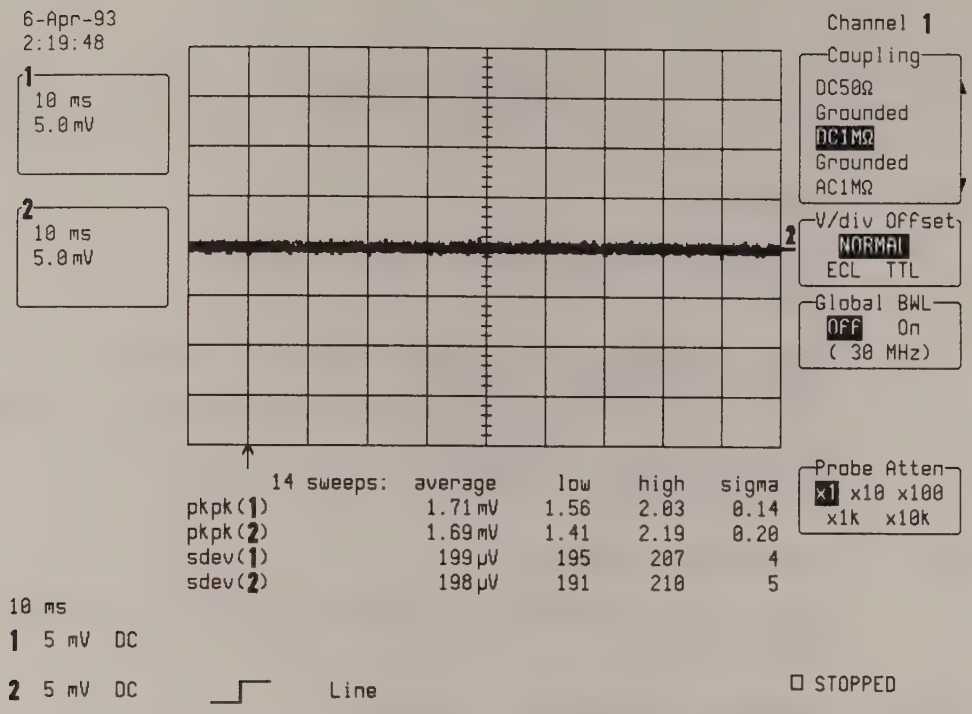
- Turn on traces : Ch1 and Ch2.
- Display setup : Standard, Persistence off, Single grid
- Input coupling : Ch1, Ch2 : 1 MOhm DC.
- Input gain : 5 mV/div.

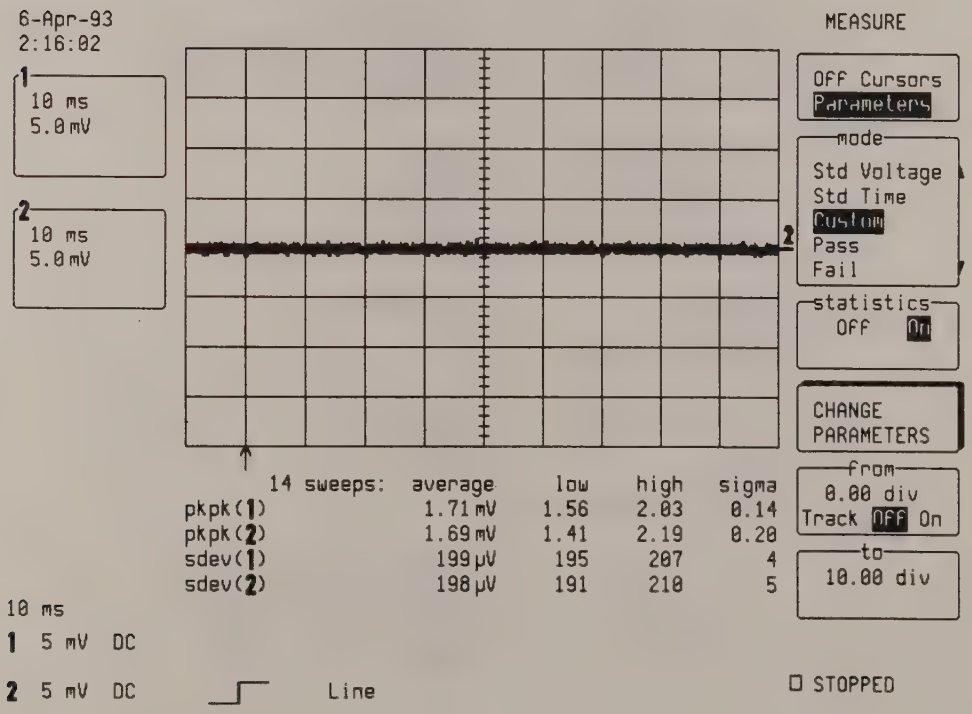
- Trigger setup :
  - Trigger on : Line
  - Slope line : Positive
  - Mode : Norm

- Timebase : 10 msec/div
- Global BWL : Off
- Probe attenuator : X1

- Cursors/Measure : Parameters
- Mode : Custom
- Statistics : On
- Change Parameters :

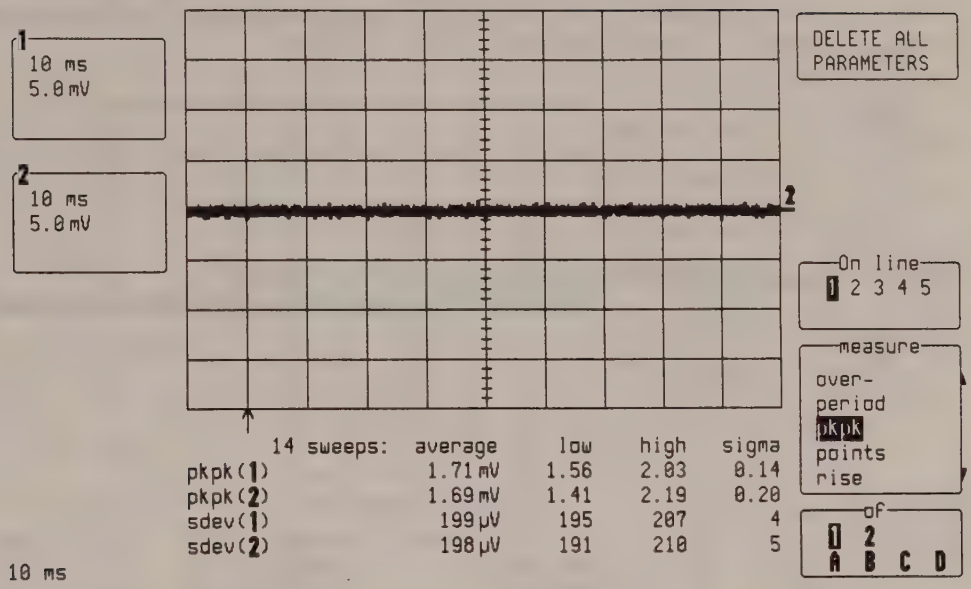
  - On line 1 : Measure pkpk of Ch1
  - On line 2 : Measure pkpk of Ch2
  - On line 3 : Measure sdev of Ch1
  - On line 4 : Measure sdev of Ch2

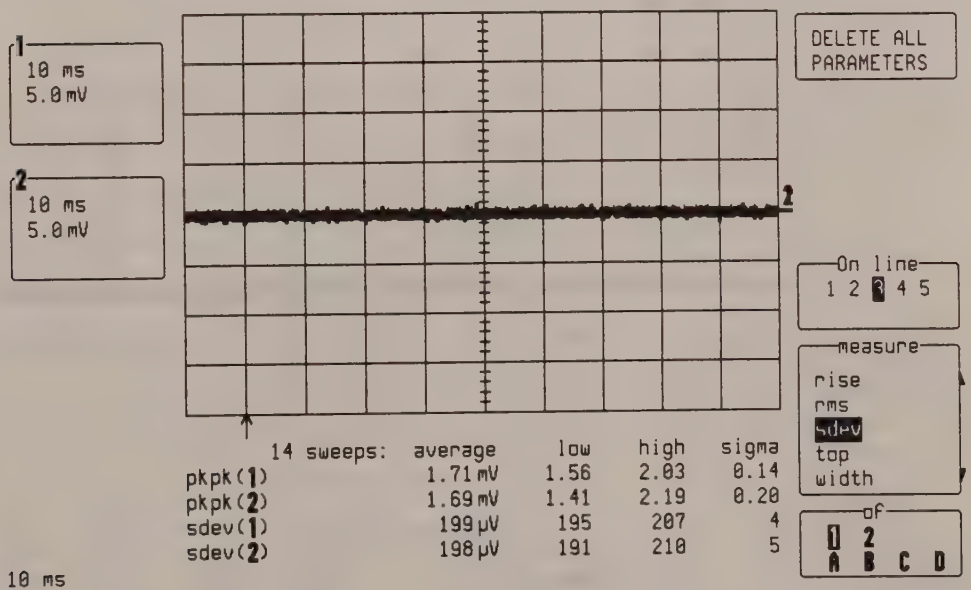

6-Apr-93
2:19:48
1
10 ms
5.0 mV
2
10 ms
5.0 mV
Channel 1
Coupling
DC50Ω
Grounded
DC1MΩ
Grounded
AC1MΩ
V/div Offset
NORMAL
ECL TTL
Global BWL
Off On
(30 MHz)
Probe Atten
x1 x10 x100
x1k x10k
14 sweeps: average low high sigma
pkpk(1) 1.71 mV 1.56 2.03 0.14
pkpk(2) 1.69 mV 1.41 2.19 0.20
sdev(1) 199 µV 195 207 4
sdev(2) 198 µV 191 210 5
10 ms
1 5 mV DC
2 5 mV DC
Line
STOPPED


6-Apr-93
2:16:02
1
10 ms
5.0 mV
2
10 ms
5.0 mV
MEASURE
Off Cursors
Parameters
mode
Std Voltage
Std Time
Custom
Pass
Fail
statistics
Off On
CHANGE
PARAMETERS
from
0.00 div
Track Off On
to
10.00 div
14 sweeps: average low high sigma
pkpk(1) 1.71 mV 1.56 2.03 0.14
pkpk(2) 1.69 mV 1.41 2.19 0.20
sdev(1) 199 µV 195 207 4
sdev(2) 198 µV 191 210 5
10 ms
1 5 mV DC
2 5 mV DC
Line
STOPPED

Check : pkpk is less than 3.6 mV.

Check : sdev is less than 360 µV.

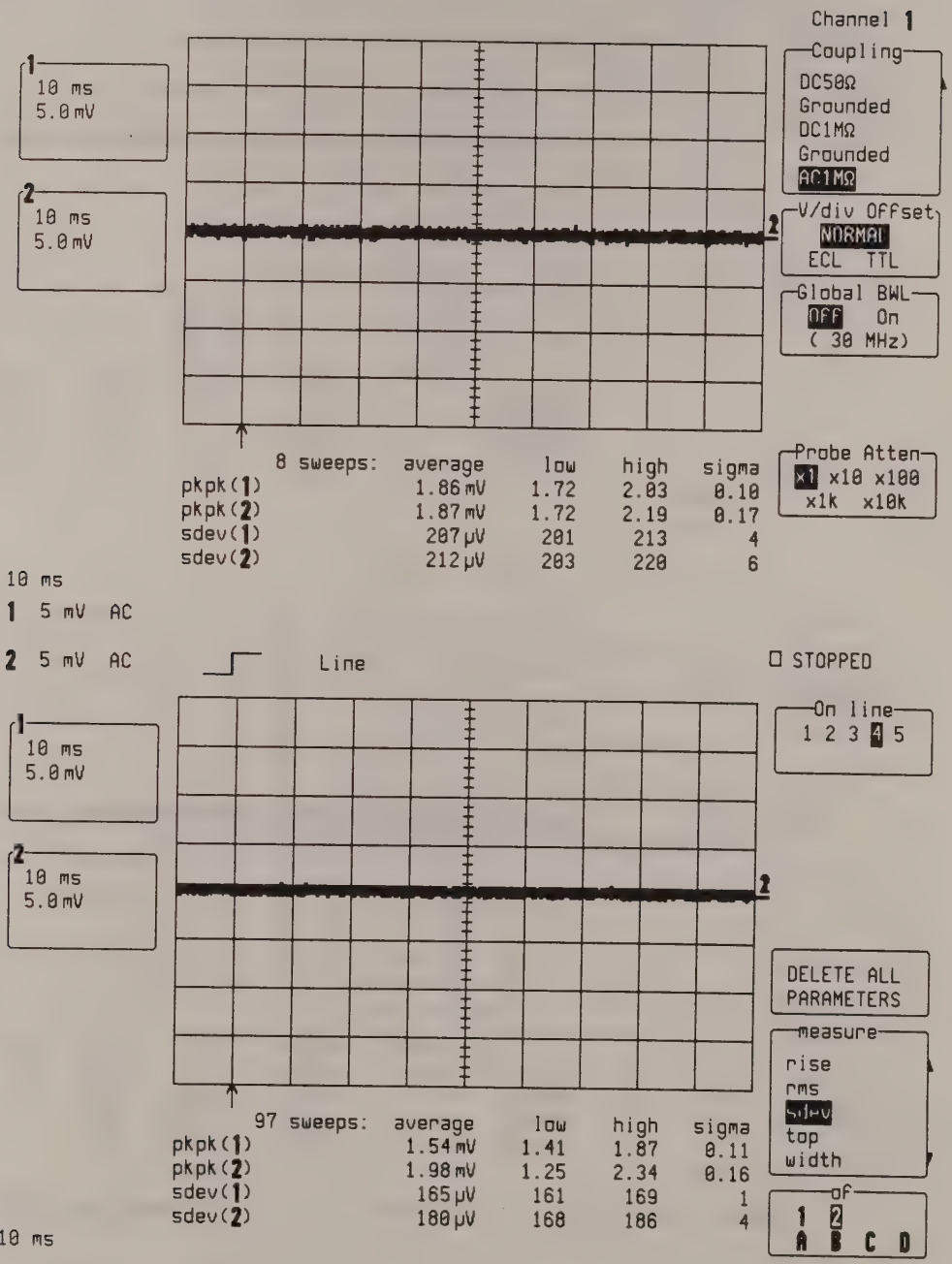




Repeat the tests for Timebase 5, 2, 1, .5 msec/div and check as above.

5.2.2 Channel 1, Channel 2 : 1 MOhm AC

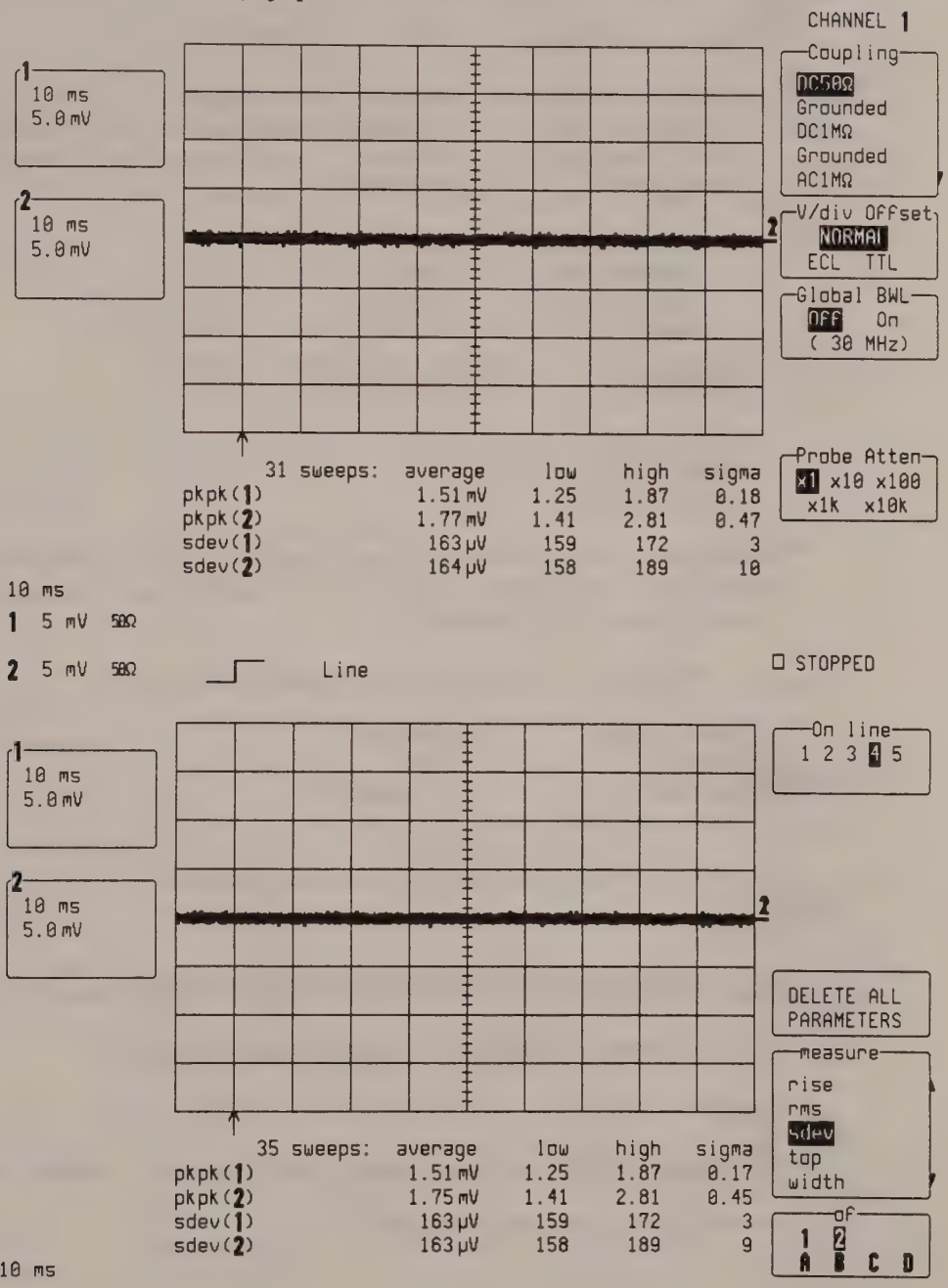
Set Channel 1 and Channel 2 input coupling to 1 MOhm AC.
Check : sdev < 360 µV, pkpk < 3.6 mV.



Repeat the tests for 5 msec, 2 msec, 1 msec and .5 msec/div.

5.2.3 Channel 1, Channel 2 : 50 Ohm DC

Set Channel 1 and Channel 2 input coupling to 50 Ohm DC
Check : sdev < 360 µV, pkpk < 3.6 mV.



Repeat the tests for 5 msec, 2 msec, 1 msec and .5 msec/div.

5.3 Channel 1, Channel 2 : Offset

Set up the DSO as follows:

- All inputs open :

- Turn on traces : Channel 1 and Channel 2.
- Display setup : Standard, Persistence off, Single grid.
- Input coupling : Channel 1 and Channel 2, 1 MOhm DC.
- Input gain : 50 mV/div.

- Trigger setup : Edge
  - Trigger on : Line
  - Slope line : Positive
  - Mode : Norm

- Timebase : 10 µsec/div

- Global BWL : Off
- Probe attenuator : X1
- Cursors/Measure : Off

Using the offset control, move the Ch1 trace slowly through the entire range and check that there is no significant change in the displayed trace. Repeat for Channel 2.

Set the Digital Storage Oscilloscope as follows :

- Input gain : 5 mV/div
- Offset : Zero
- Timebase : 50 µsec/div

Switch between coupling 50 Ohm and Grounded,

Check:

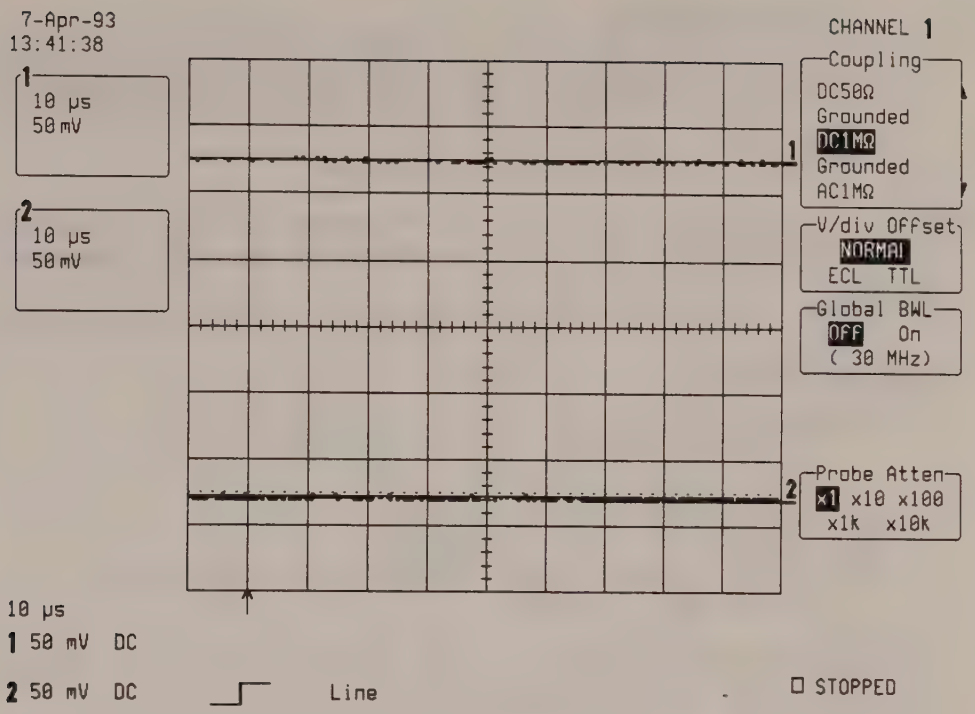
The trace should not move more than 1 mV or a minor division.

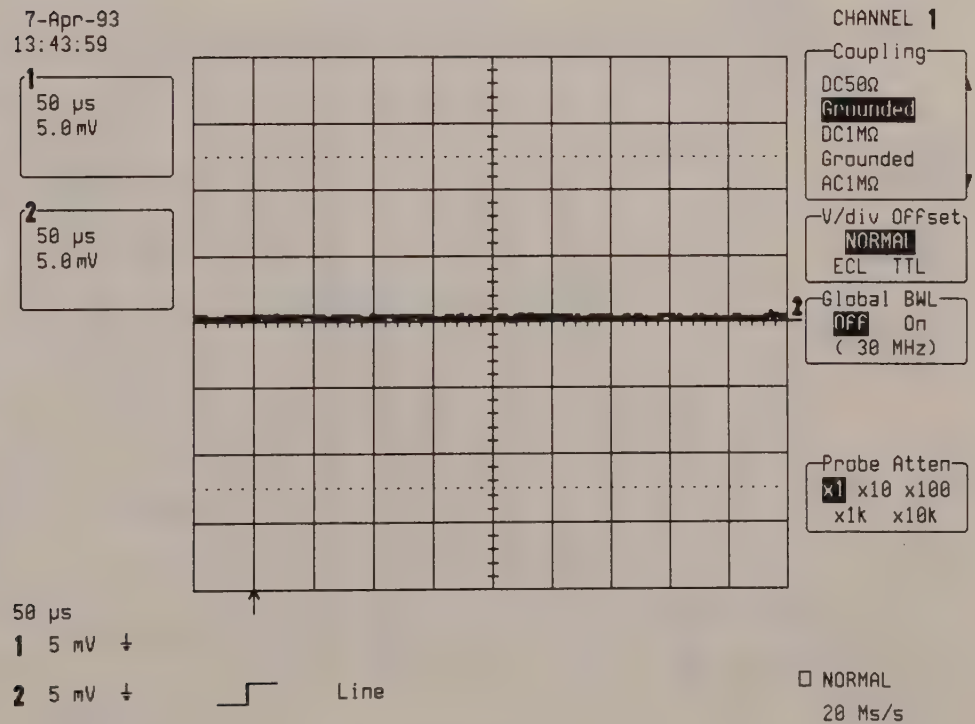
Switch between coupling 1 MOhm DC and Grounded,

Check:

The trace should not move more than 1 mV or a minor division.

Repeat the tests for Channel 2.


7-Apr-93
13:41:38
1
10 µs
50 mV
2
10 µs
50 mV
CHANNEL 1
Coupling
DC50Ω
Grounded
DC1MΩ
Grounded
AC1MΩ
V/div Offset
NORMAL
ECL TTL
Global BWL
Off On
(30 MHz)
Probe Atten
x1 x10 x100
x1k x10k
10 µs
1 50 mV DC
2 50 mV DC
Line
STOPPED


7-Apr-93
13:43:59
1
50 µs
5.0 mV
2
50 µs
5.0 mV
CHANNEL 1
Coupling
DC50Ω
Grounded
DC1MΩ
Grounded
AC1MΩ
V/div Offset
NORMAL
ECL TTL
Global BWL
Off On
(30 MHz)
Probe Atten
x1 x10 x100
x1k x10k
50 µs
1 5 mV
2 5 mV
Line
NORMAL
20 Ms/s

5.4 Input Impedance

The input impedance should be 50 Ohm ± 1% and 1 MOhm ± 1%.
See Front end Calibration procedure for further detail.

5.5 Bandwidth at 50 Ohm input impedance

The purpose of this test is to ensure that the entire 9310 system has a bandwidth of at least 300 MHz at 50 Ohm input impedance.

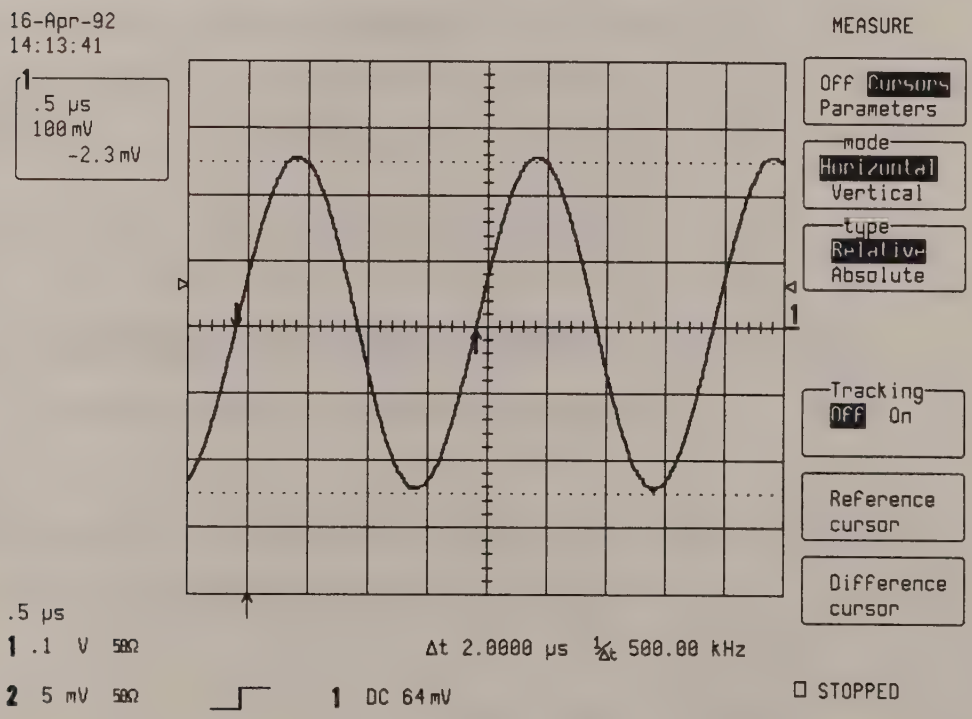
Set up a leveled sine wave generator (for example Marconi 2030):

- Frequency : .5 MHz

Connect the generator output to Channel 1 input.

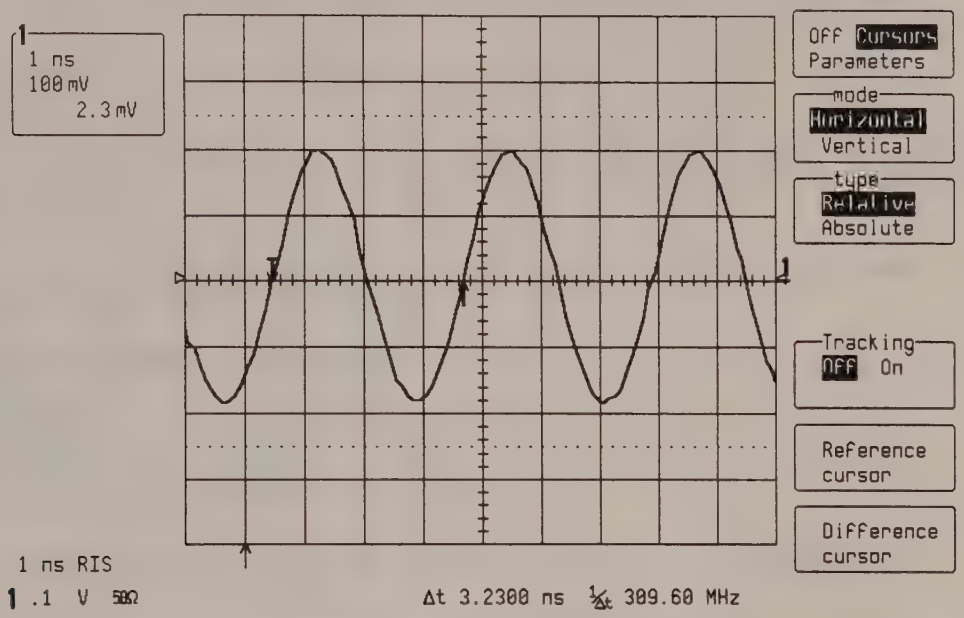
- Input coupling : 50 Ohm
- Input gain : 0.1 V/div
- Timebase : 0.5 µsec/div
- Trigger setup : Edge, Channel 1, DC, Pos, Norm
- Global BWL : Off

Adjust the generator output amplitude and Ch1 offset to get a 5 divisions peak to peak sine wave.

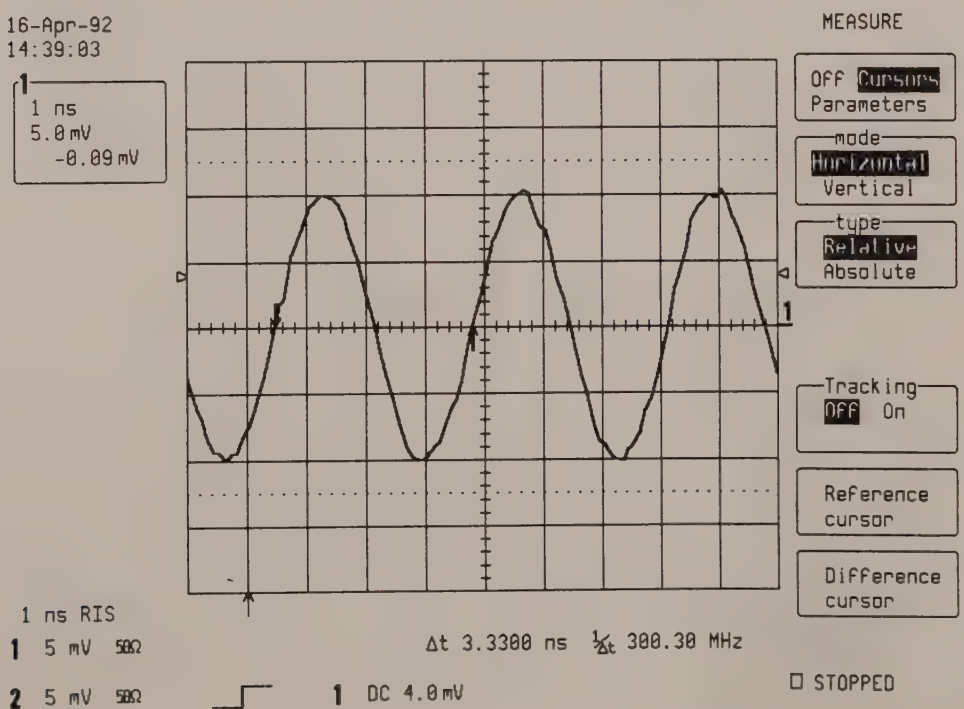


Increase the generator frequency, while decreasing the time/div until the sine wave peak to peak amplitude is .7 x 5 divisions = 3.5 divisions (3dB point) or 70% of the initial amplitude at .5 MHz.

Check : The frequency of the generator must be at least 300 MHz.

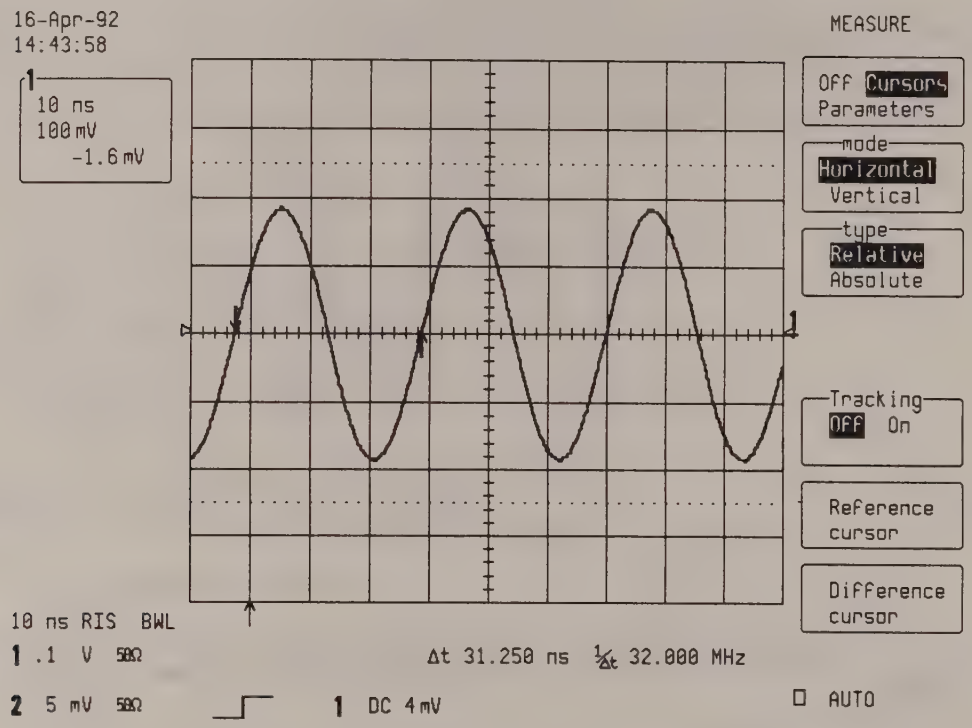


Repeat the above test for input = 50 mV, 20 mV, 10 mV and 5 mV/div. Check at 5 mV/div that the bandwidth is at least 270 MHz.



Set the bandwidth limiter on.

Check that the frequency of the generator at the 3dB point is between 22 MHz and 43 MHz.



Repeat all the tests for Channel 2.

5.6 Bandwidth at 1 MOhm Input Impedance

The purpose of this test is to ensure that the entire 9310 system has a bandwidth of at least 250 MHz at probe tip.

Set up a Tektronix SG503 leveled sine wave generator or equivalent.

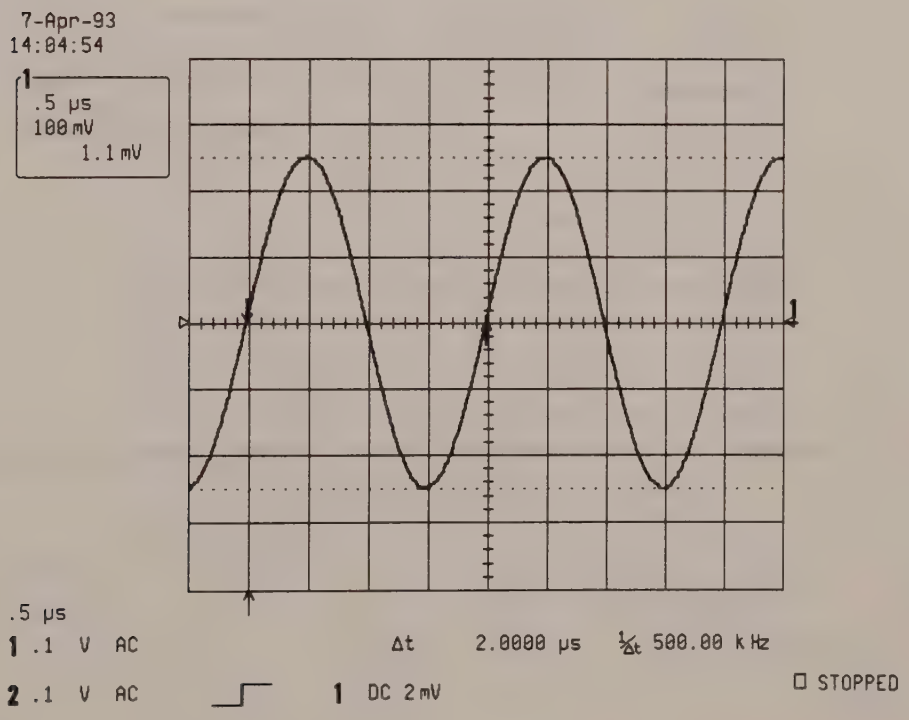
- Frequency : .5 MHz
- Amplitude : 5V peak to peak

Terminate the output of the SG503 via a 50 Ohm feedthrough and connect it to the channel 1 input through a 10X-probe using the probe tip BNC Jack adapter.

Make sure the probe is perfectly adjusted, low frequency and high frequency (see brochure enclosed with probe).

- Input coupling : 1 MOhm/AC
- Input gain : .1 V/div
- Timebase : .5 µs/div
- Trigger setup : Edge, Ch1, DC, Positive, Norm
- Global BWL : Off
- Probe attenuator : X10

Set the SG503 output amplitude and the Ch1 offset to provide a 5 divisions peak to peak sine wave.

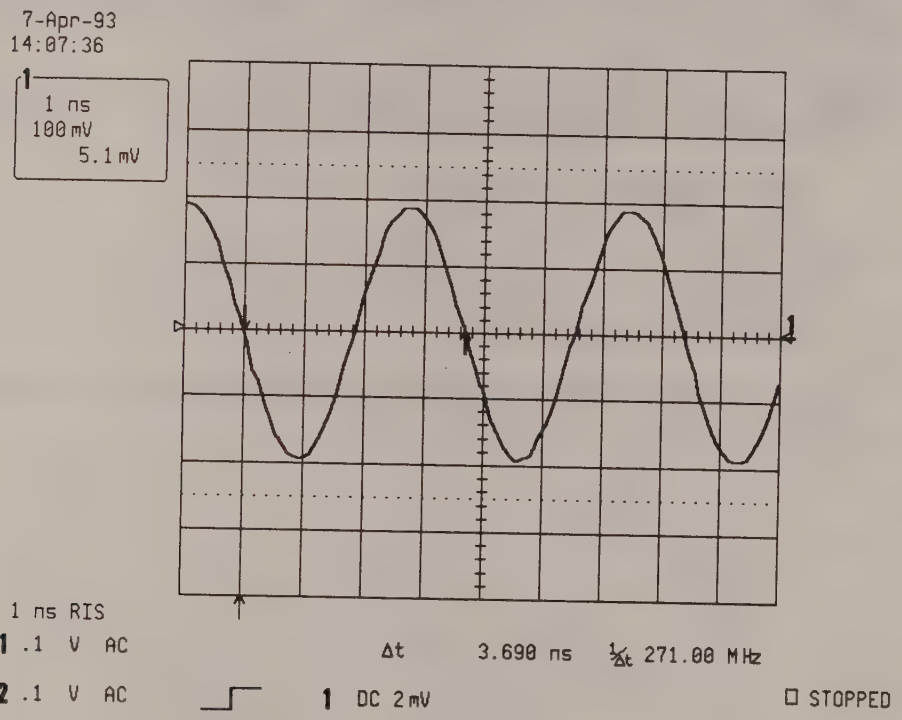


Increase the SG503 frequency, while decreasing the time/div until the sine wave peak to peak amplitude is :

.7 x 5 divisions = 3.5 divisions (3 dB point) or 70% of the initial amplitude at .5 MHz.

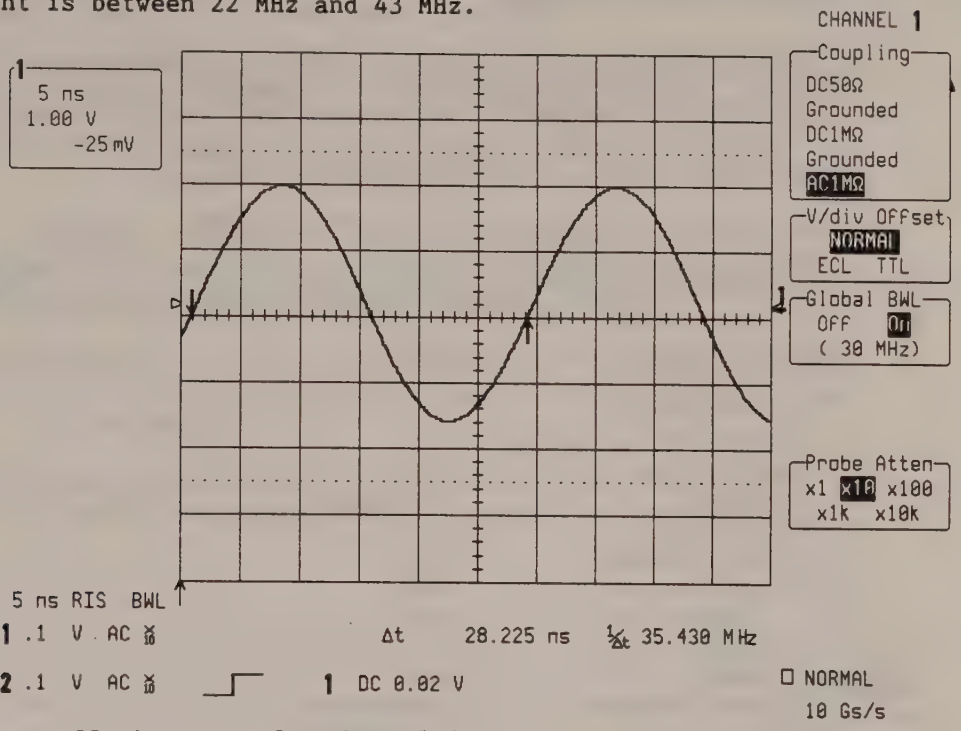
Check :

The frequency of the SG503 must be at least 250 MHz.

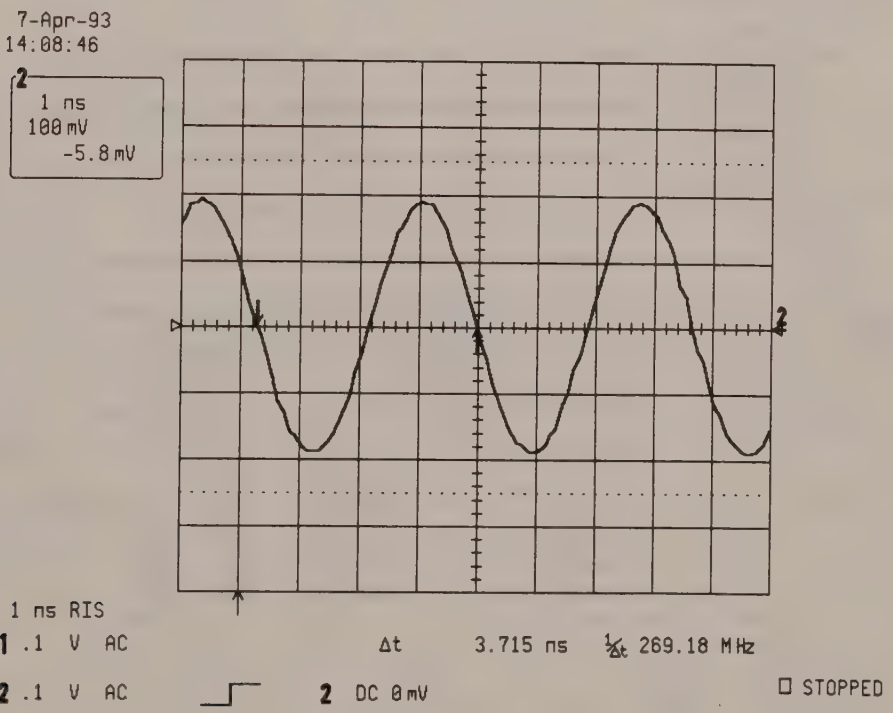


Repeat the above test for input = 50 mV, 20 mV, 10 mV, and 5 mV/div.

Set the bandwidth limiter on, and check that the frequency at the 3 dB point is between 22 MHz and 43 MHz.



Repeat all the tests for Channel 2.



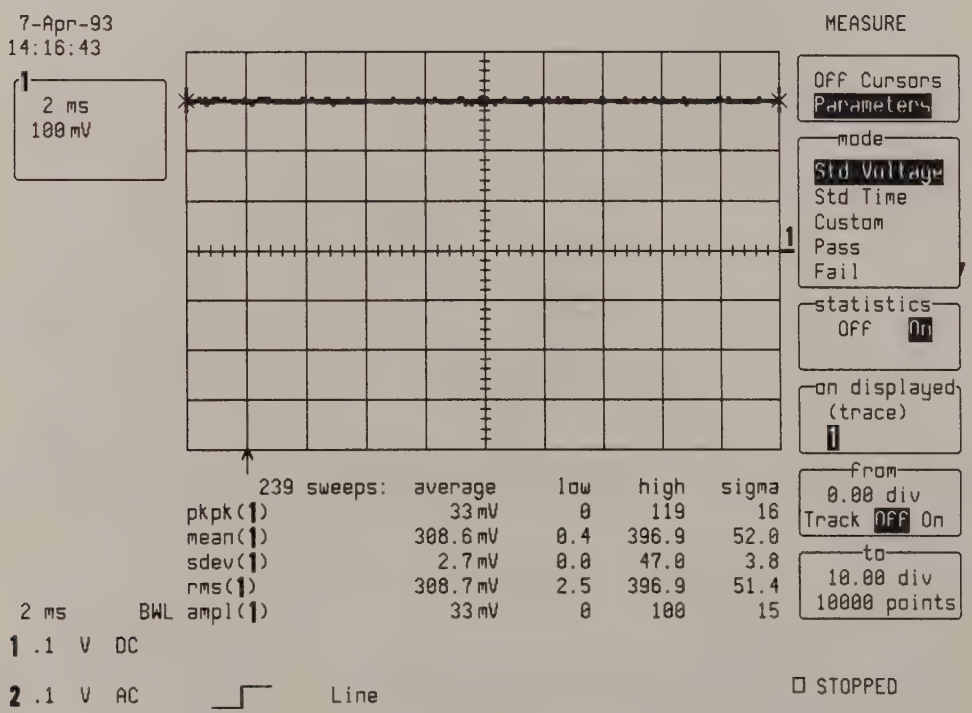
5.7 Manual Linearity Test using an External High Precision Voltage Source (NIST Traceable)

In the absence of the Computer Automated Calibration System based on LeCroy Calibration software (LeCalsoft) for the 9310 model oscilloscope, the manual performance test procedure can be followed to establish a NIST traceable calibration, provided the measurement instruments used are NIST traceable calibrated.

For a NIST calibration, follow the manual linearity test procedure using a calibrated and certified high precision (better than 0.1%) voltage source, for example TEK PS5004 supported by LeCalsoft.

Manual linearity test procedure

- Set scope to:
- Channel to be tested : On
- Input offset : 0 mV
- Timebase : 2 msec/div
- Global BWL : On
- Probe attenuator : X1
- Trigger setup : Edge
  - Trigger on : Line
  - Slope line : Positive
  - Mode : Norm
- Cursors/Measure : Parameters
- Mode : Std Voltage
- Statistics : On



For each V/div and both 50 Ohm and 1 MOhm DC coupling and for all channels separately, check the following:

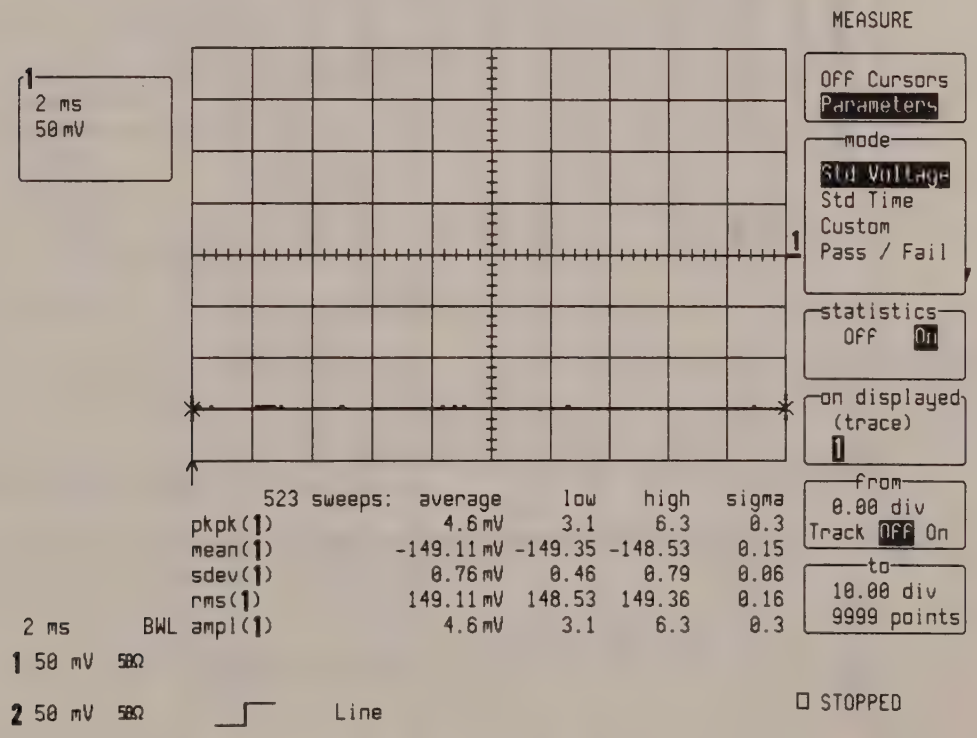
From the high precision voltage source, apply the following 3 voltage values, one after another, to the channel to be tested:

+ 3 major screen divisions
0 " " "
- 3 major screen divisions

For each point, read off the " Mean " parameter voltage, and compare to the digital read-out of the voltage reference.

The difference of the two values in mV or V, should be within 2%, 3% or 5% of full scale of the scope, depending of the sensitivity. See table on page 16.

For the low sensitivities : 2 mV, 5 mV, 10 mV, 20 mV and 50 mV/div, use a 50 Ohm 20 dB attenuator or 1 MOhm 20 dB attenuator.



Range	50Ω Test	1MΩ Test	Test of Conditions			Limit	Reading Mean parameter	
Volt/div	20 dB attenuator	20 dB attenuator	Power supply output	Scope input	Scope full scale	Tolerance % of full scale	Min value	Max value
2 mV	YES	YES	± 60 mV	± 6 mV	± 16 mV	± 5%	± 5.2 mV	± 6.8 mV
5 mV	YES	YES	± 150 mV	± 15 mV	± 40 mV	± 3%	± 13.8 mV	± 16.2 mV
10 mV	YES	YES	± 300 mV	± 30 mV	± 80 mV	± 2%	± 28.4 mV	± 31.6 mV
20 mV	YES	YES	± 600 mV	± 60 mV	± 160 mV	± 2%	± 56.8 mV	± 63.2 mV
50 mV	YES	YES	± 1.5 V	± 150 mV	± 400 mV	± 2%	± 142 mV	± 158 mV
.1 V	NO	NO	± 300 mV	± 300 mV	± 800 mV	± 2%	± 284 mV	± 316 mV
.2 V	NO	NO	± 600 mV	± 600 mV	± 1.6 V	± 2%	± 568 mV	± 632 mV
.5 V	NO	NO	± 1.5 V	± 1.5 V	± 4 V	± 2%	± 1.42 V	± 1.58 V
1 V	NO	NO	± 3 V	± 3 V	± 8 V	± 2%	± 2.84 V	± 3.16 V

Figure 5.1

5.8 Trigger Level

Set up any sine wave generator, capable of generating sine waves to 500 Hz, for example Intron IFG-422 or Topward TFG-8101:

- Frequency : 500 Hz

Connect the output of the generator to Channel 1.

Set up the DSO:

Turn off all the traces except Ch1.

- Trigger setup : Edge
  - Trigger on : Ch1
  - Coupling : DC
  - Mode : Norm
  - Slope : Positive
  - Delay : 50% Pretrigger
  - Level : 0.0 mV

Set the input CH1:

- Coupling : 1 MOhm, DC
- Global BWL : Off
- Probe atten : X1
- Gain : .5 V/div
- Offset : Zero

Set the time base:

- Time/div : .2 msec/div

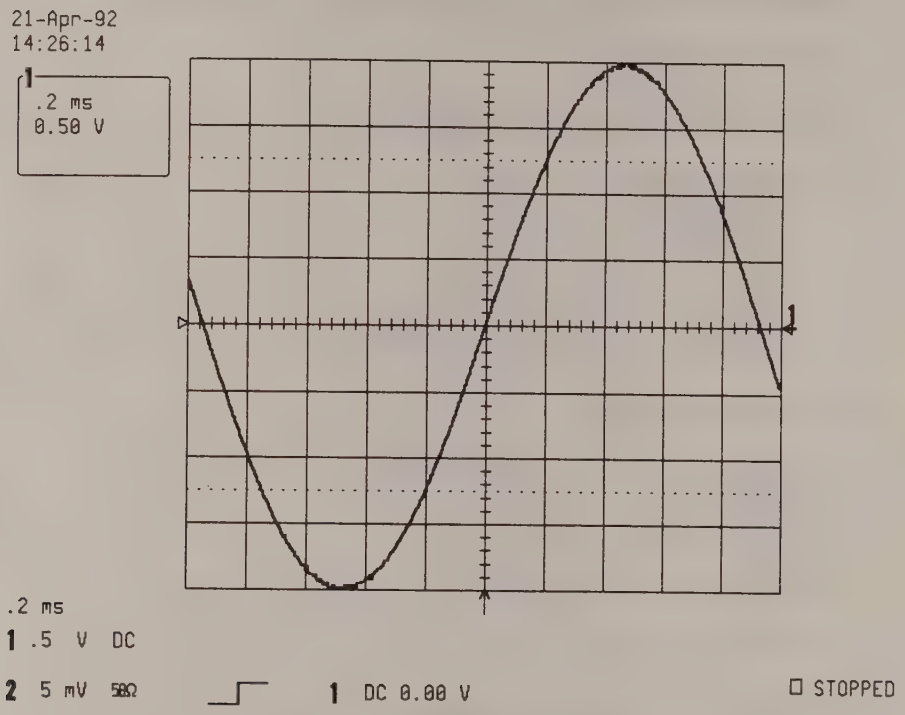
Adjust the sine wave generator's output amplitude to get 8 divisions p-p, corresponding to a 2 V amplitude.

It is important that the offset of the input is set to zero mV, (use panel status to verify).

Use the offset adjustment of the sine wave generator to center the signal with respect to the screen.

Check:

The sine wave must pass through the horizontal center of the screen
(50% Pretrigger line) at the vertical position zero,
(vertical center) within ± 2 minor divisions.



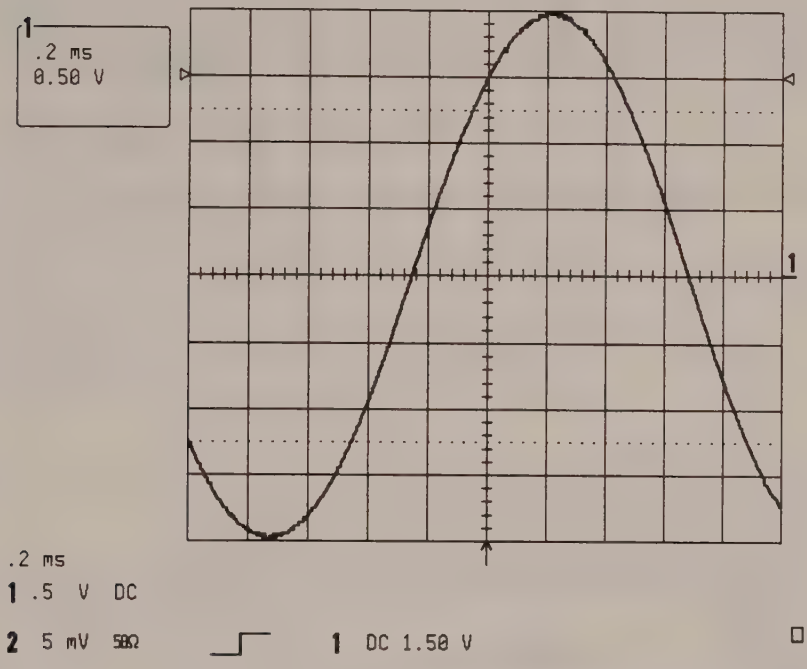
Repeat the test for the following conditions:

- Trigger slope Pos and Neg (verify slope at check point)
- Trigger coupling DC, AC, HFrej

Set the trigger level to + 1.5 V.

Check:

The sine wave must pass the horizontal center at + 3 divisions within ± 2 minor divisions.

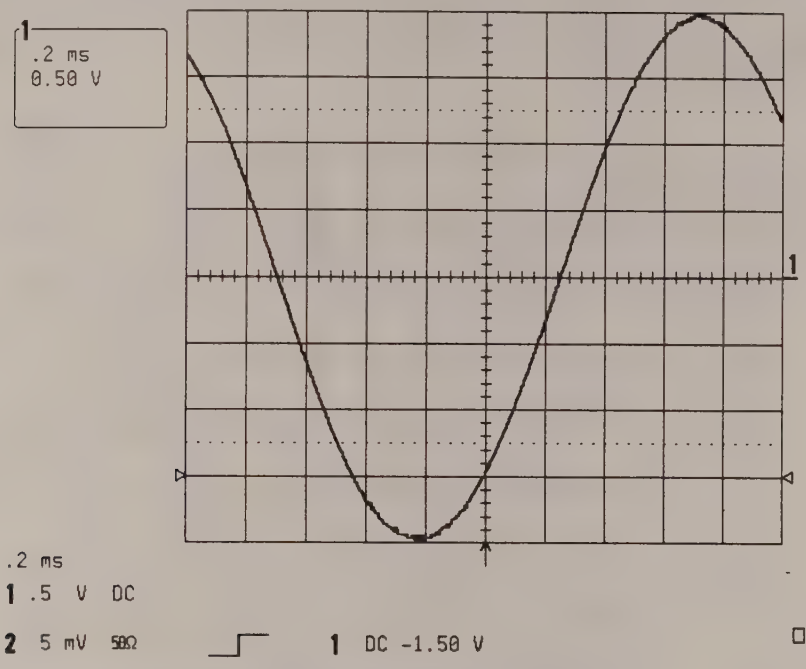


Repeat the test for the following conditions:

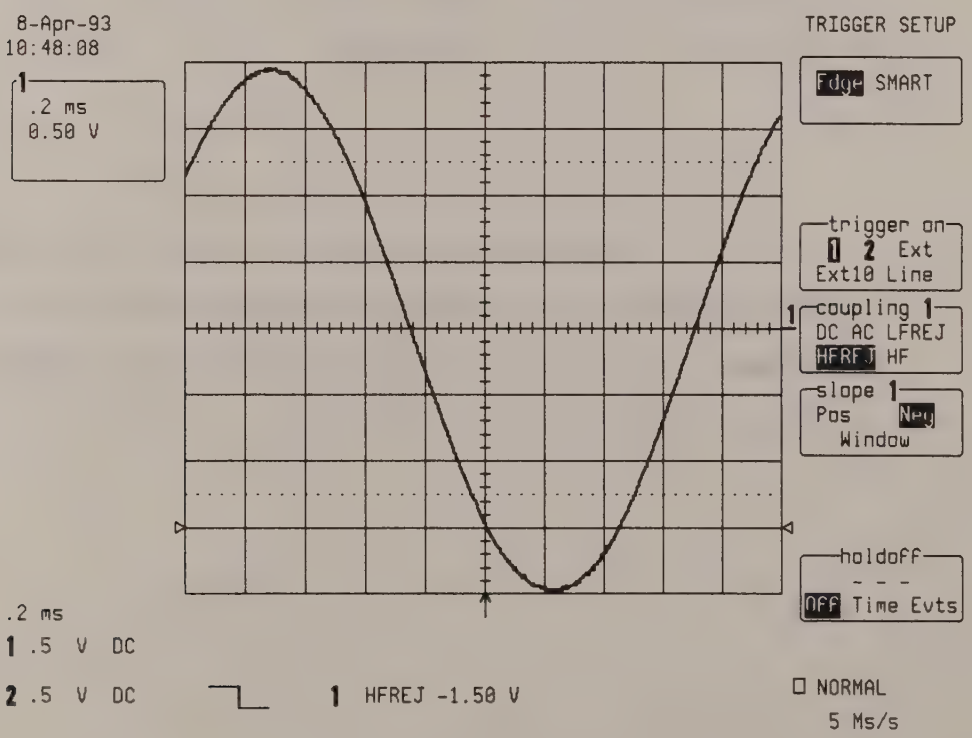
- Trigger slope Pos and Neg (verify slope at check point)
- Trigger coupling DC, AC, and HFrej

Set the trigger level to - 1.5 V.

The sine wave must pass the horizontal center at - 3 divisions within ± 2 minor divisions.



Repeat the test for the following conditions:
- Trigger slope Pos and Neg, Trigger coupling DC, AC, and HFrej



Disconnect the input from Channel 1 and connect it to Channel 2.

- Turn on trace for Channel 2.

- Set the trigger source to Channel 2.

Repeat the above check procedure for Ch2, trigger slope positive and negative, trigger coupling DC, AC, HFrej.

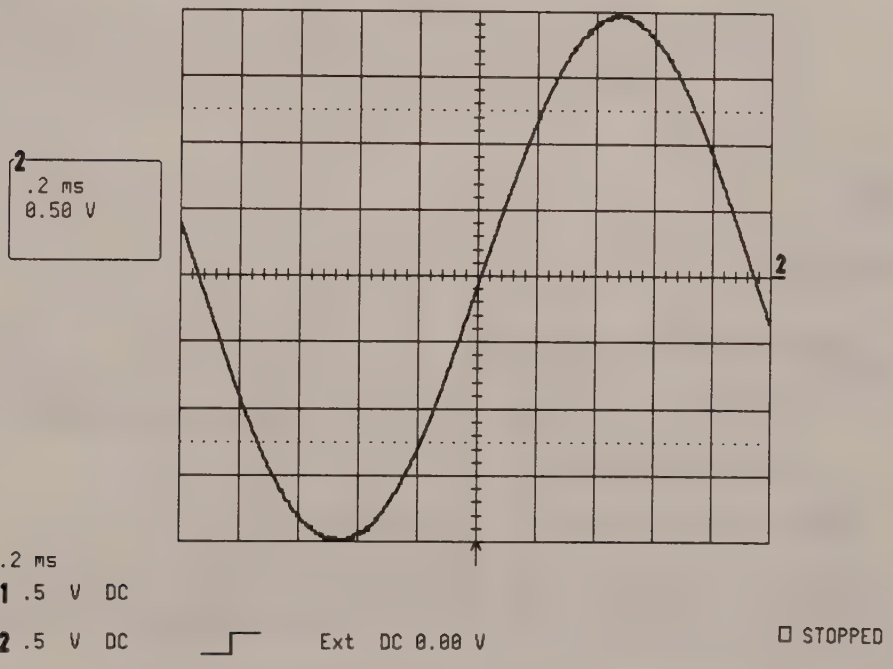
Connect the output of the generator to Ext input and to Ch2 via a coaxial T-connector. The cable length from Ext to Ch2 must be short, at most 2 nsec.

- Set trigger source to Ext.

Repeat the above check procedure for Ext trigger, but observing the effect on Channel 2.

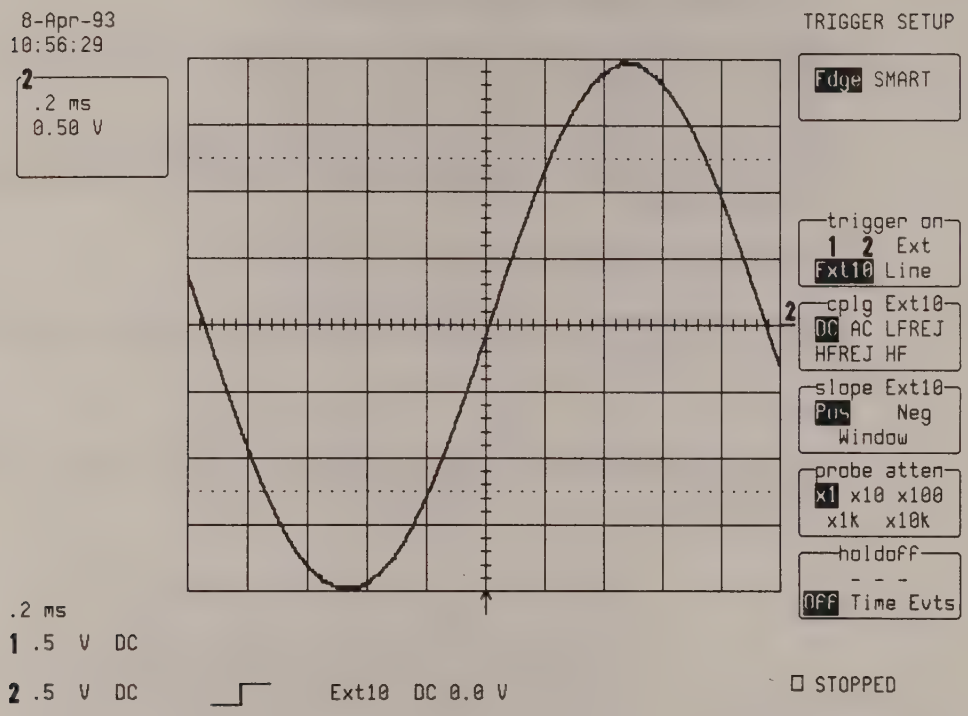
Check:

The sine wave must pass the horizontal center within ± 2 minor divisions.



Repeat the above check procedure for Ext trigger / 10.

The tolerance for the level crossing is ± 3 minor divisions.



5.9 Bandwidth for Ext Trigger

Set up a sine wave generator (for example Marconi 2030):

- Frequency 300 MHz

- Amplitude 2.8 V p-p (maximum for Marconi)

Connect the output of the generator to Ext input and to Ch2 using a coaxial T-connector. The cable length between Ext and Ch2 must be short (at most 2 nsec).

Set up the DSO:

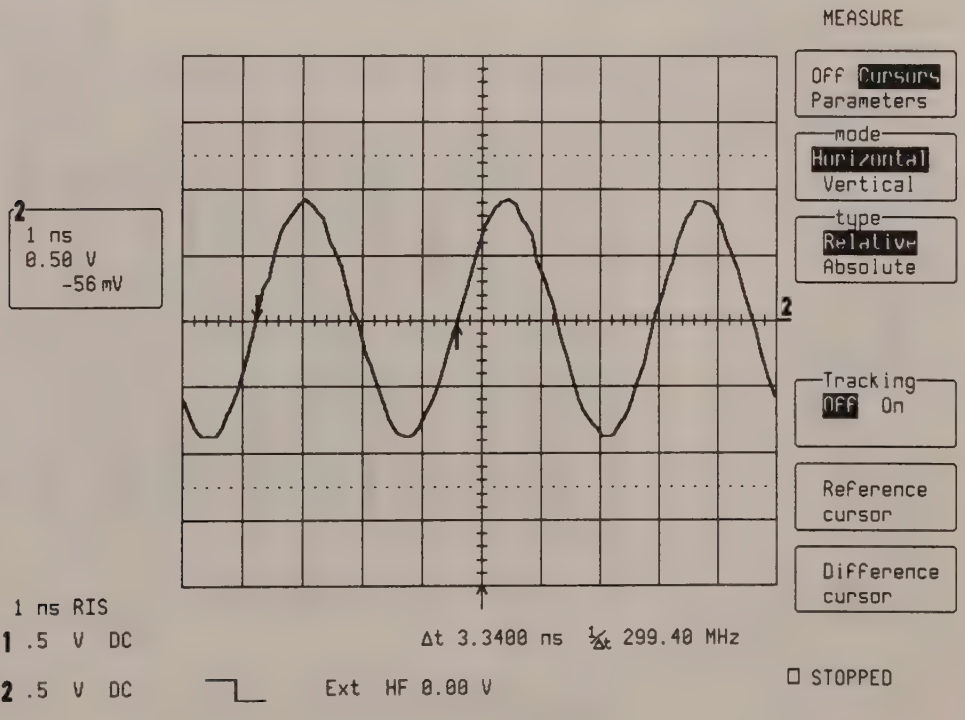
- Turn off all the traces, except Channel 2.
- Display setup : Standard, Persistence off, Single grid
- Trigger setup : Edge
  - Trigger on : Ext
  - Slope line : Positive
  - Mode : Normal
  - Coupling : HF
  - Delay : 50%
  - Level : Zero mV

Set input Ch2 :
- Coupling : 50 Ohm
- Global BWL : Off
- Probe atten : X1
- Gain : .5 V/div
- Offset : Zero mV

Set time base :
- Timebase : 1 nsec/div
- Ris : On

Check:

The scope must keep triggering in a stable way (i.e., a smooth 300 MHz sine wave must be visible on the display).



5.10 Smart Trigger

5.10.1 Trigger on Pulse Width >, <

Set up the DSO :

Turn off all the traces except Channel 1.

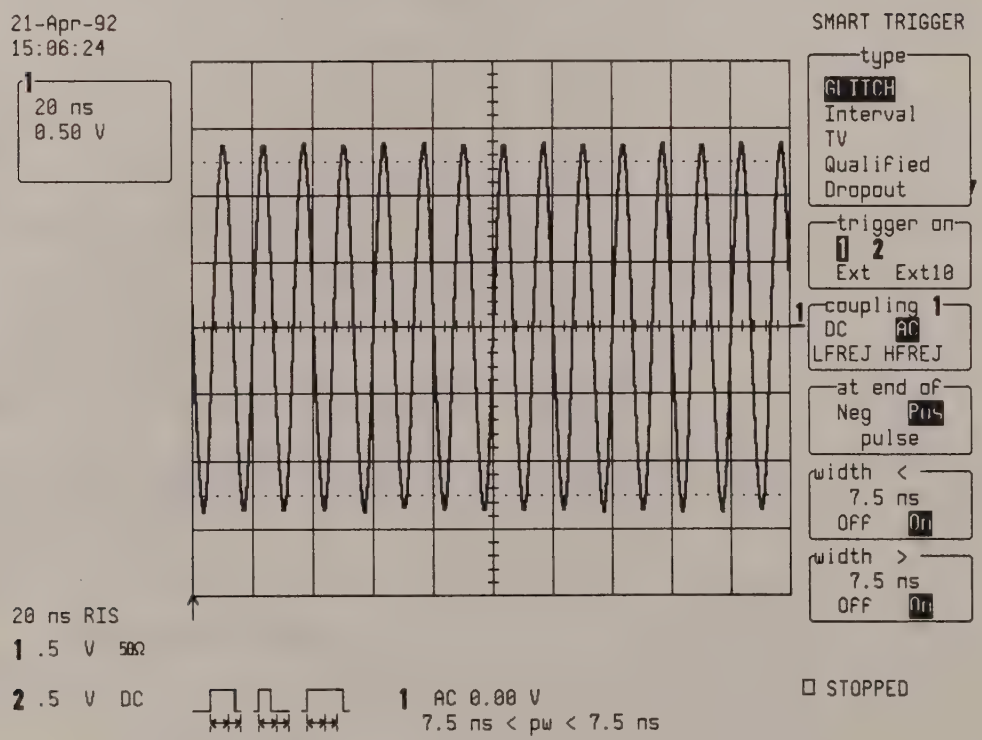
- Trigger setup : Smart
- Setup smart trigger : Glitch
- Trigger on : Channel 1
- Coupling : AC
- at the end of : Positive
- Width < and > : 7.5 ns
- Trigger level : Zero mV
- Trigger delay : Zero % Pretrigger

Set the input of Ch1 :

- Coupling : 50 Ohm
- Gain : .5 V/div
- Offset : Zero mV

Set the time base :

- Time/div : 20 nsec/div
- RIS : On



Apply a sine wave signal of 2.8 V p-p at 75 MHz.
Adjust pulse width to 7.5 nsec for both < and >.

Switch between width < On, and width > On.

Check:

Width < 7.5 nsec, the scope should trigger
Width > 7.5 nsec, the scope should not trigger

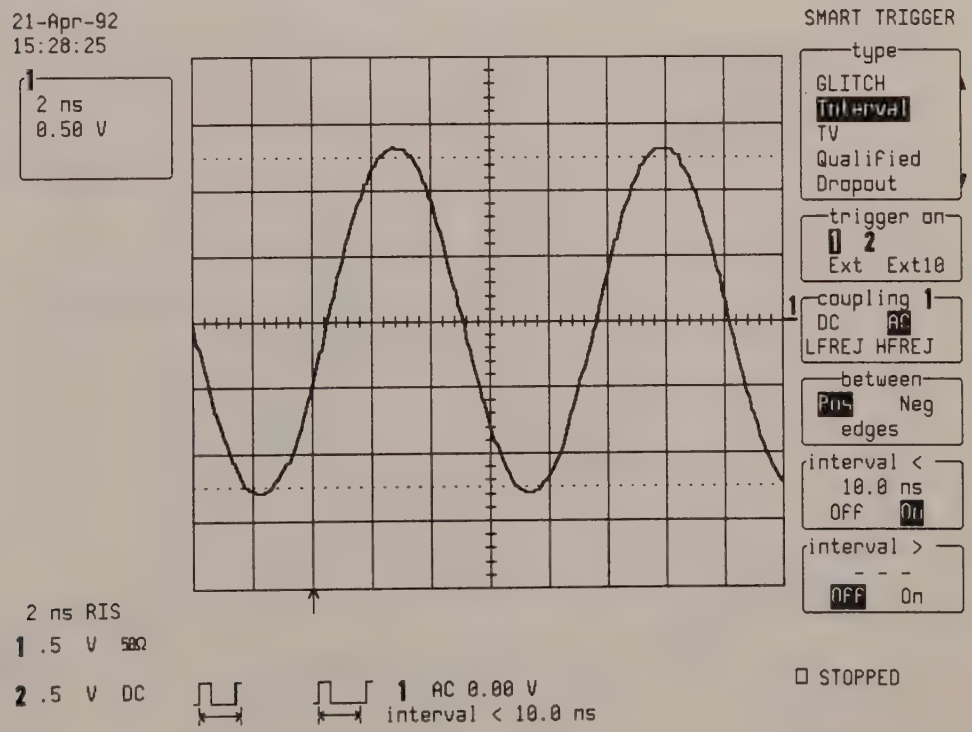
Repeat the above test for Channel 2.

5.10.2 Trigger on Interval Width >, <

Set up the DSO :

Turn off all the traces except Channel 1.

- Trigger setup : Smart
- Setup smart trigger : Interval
- Trigger on : Channel 1
- Coupling : AC
- Between : Positive
- Interval < and > : 10 ns
- Trigger level : Zero mV
- Trigger delay : Zero % Pretrigger



Set the input of Ch1 :

- Coupling : 50 Ohm
- Gain : .5 V/div
- Offset : Zero mV

Set the time base :

- Time/div : 2 nsec/div

Apply a sine wave signal of 2.8 V p-p at 200 MHz to Ch1.

- Turn Interval > : Off
- Turn Interval < : On

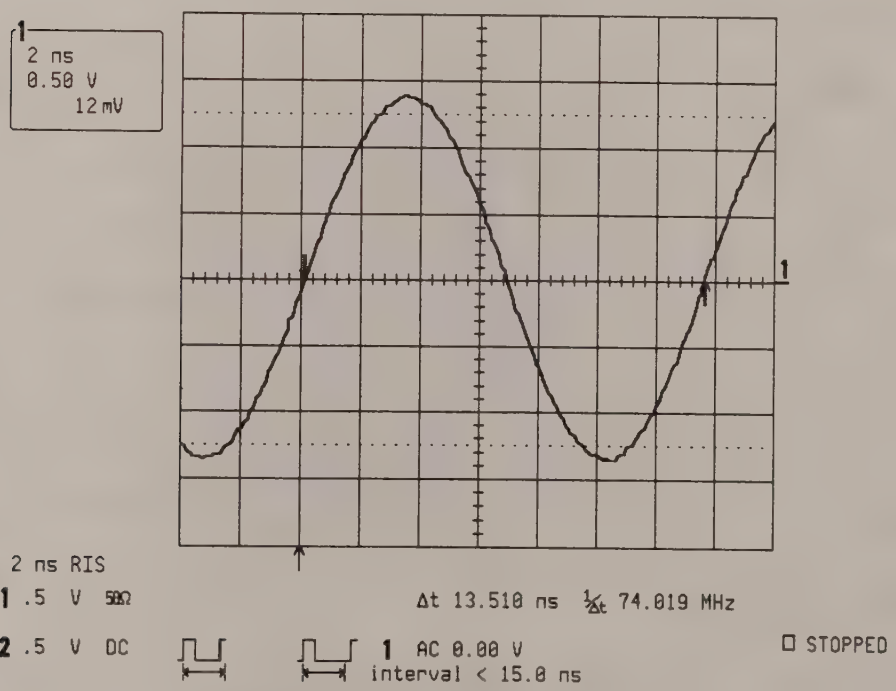
Check:

200 MHz : Interval < 10 nsec, scope should trigger
110 MHz : Interval < 10 nsec, scope should trigger
91 MHz : Interval < 10 nsec, scope should NOT trigger

Set frequency to 74 MHz and interval to < 15 nsec.

Check:

74 MHz : Interval < 15 nsec, scope should trigger
61 MHz : Interval < 15 nsec, scope should NOT trigger



Set up the DSO :

- Trigger setup : Smart
- Setup smart trigger : Interval
- Trigger on : Channel 1
- Coupling : AC
- Between : Positive
- Interval < and > : 25 ns
- Trigger level : Zero mV
- Trigger delay : Zero % Pretrigger

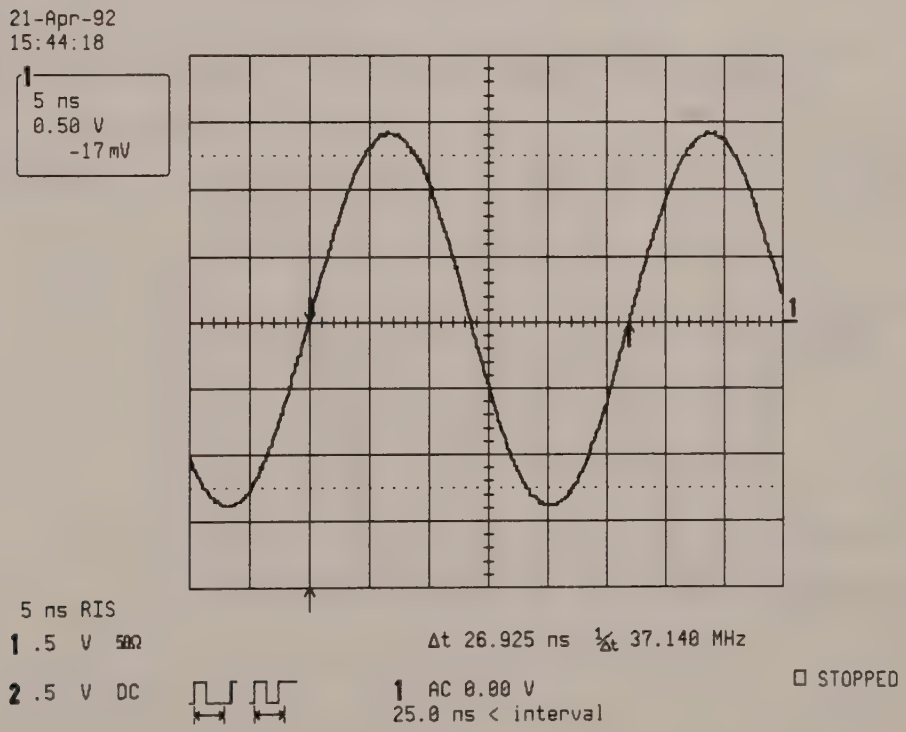
Set the input of Ch1 :
- Coupling : 50 Ohm
- Gain : .5 V/div
- Offset : Zero mV
- Timebase : 5 nsec/div

Apply sine wave signal of 2.8 V p-p at 100 MHz to Ch1.

- Turn interval < : Off
- Turn interval > : On

Check:

100 MHz : Interval > 25 nsec, scope should NOT trigger
44 MHz : Interval > 25 nsec, scope should NOT trigger
37 MHz : Interval > 25 nsec, scope should trigger

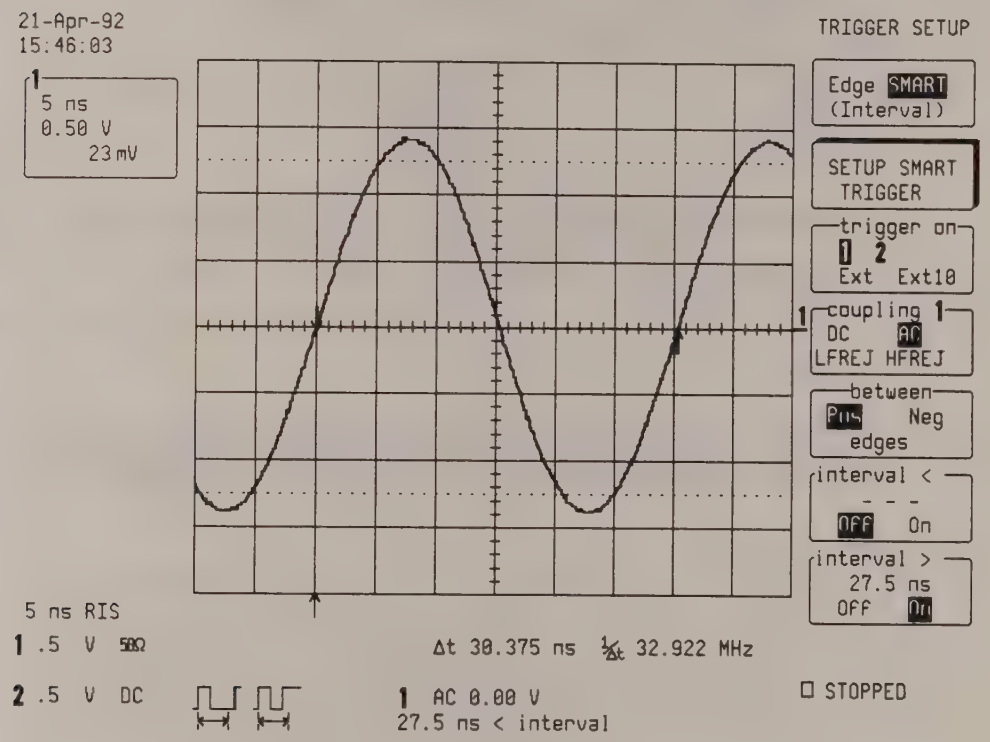


Set the frequency to 40 MHz and interval width to > 27.5 nsec.

Check:

40 MHz : Interval > 27.5 nsec, scope should NOT trigger

33 MHz : Interval > 27.5 nsec, scope should trigger



Repeat all the above tests for Channel 2.

5.11 Time Base Accuracy

5.11.1 Manual Time Base Verification

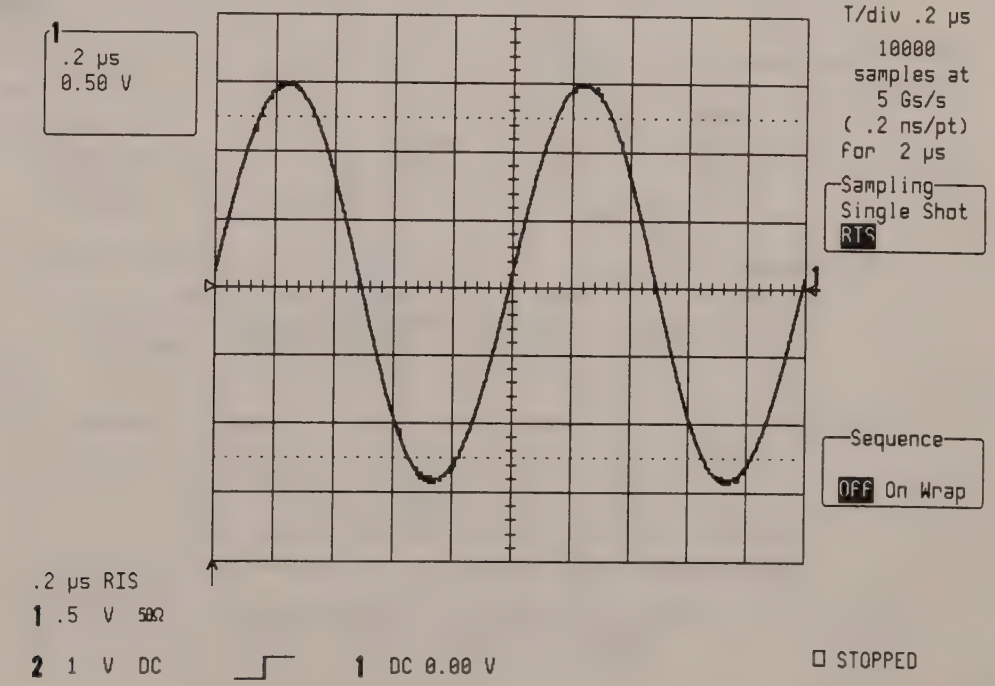
In order to verify the time base, use a sine wave generator of 1 MHz with a frequency accuracy of better than 10 ppm, (for example Marconi 2030).
The following procedure describes a method to check whether the accuracy of the clock is:

100 MHz ± 20 ppm (± 0.002%).

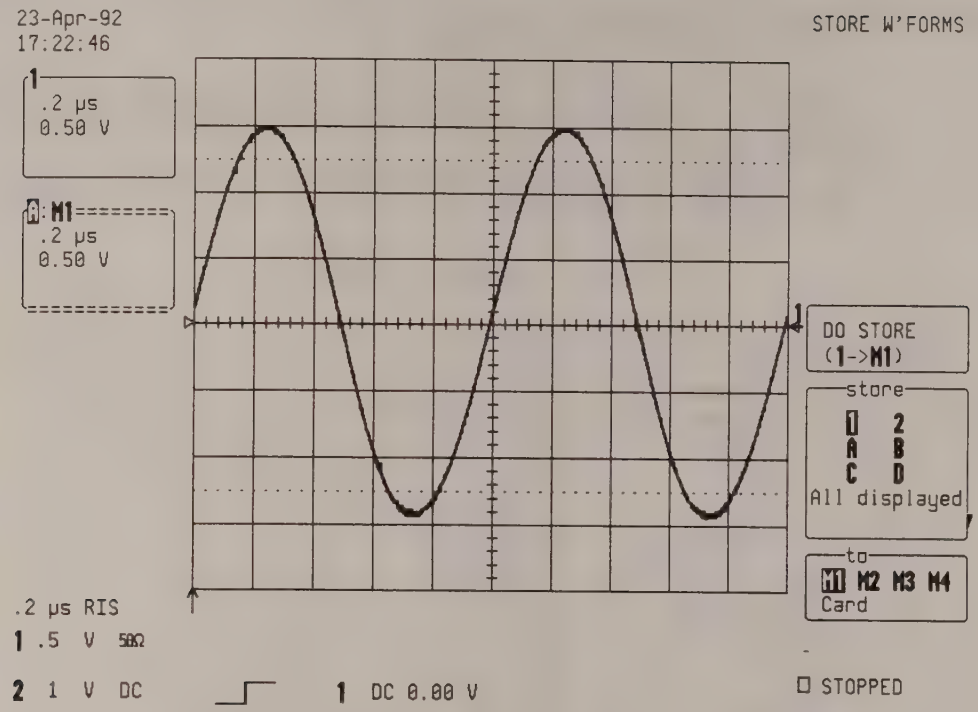
Set up the DSO as follows :

- Trigger setup : Edge
  - Trigger on : Channel 1
  - Slope line : Positive
  - Coupl : DC
  - Mode : Norm
  - Delay : 0% Pretrigger
  - Level : Zero mv
- Turn on trace : Channel 1
- Coupling : 50 Ohm
- Global BWL : Off
- Probe atten : X1
- Gain : .5 V/div
- Offset : Zero mV
- Timebase : .2 µsec/div
- RIS : On

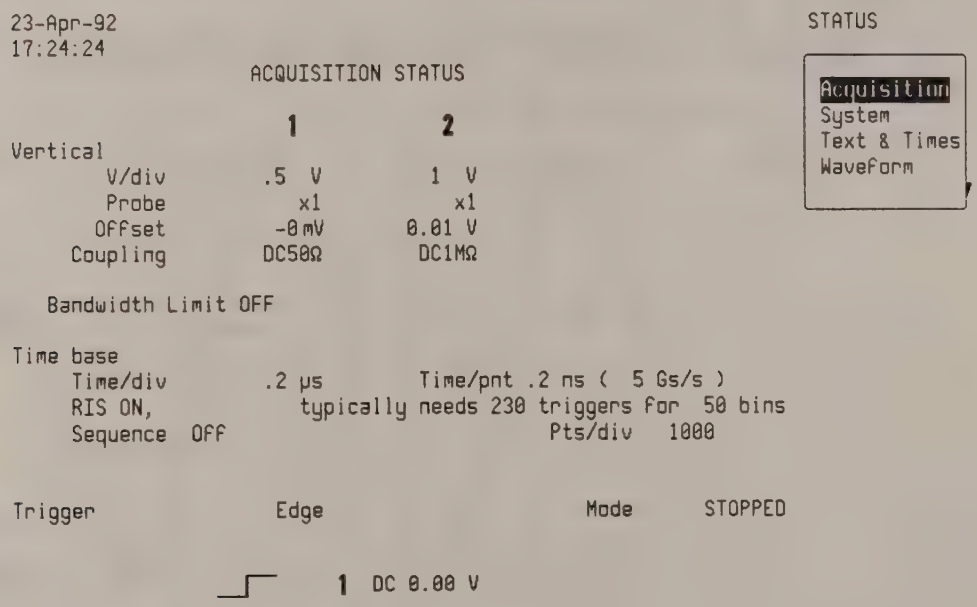
Set the sine wave generator to 1 MHz and apply a signal to Ch1. Adjust amplitude to get about a 6 divisions peak to peak display.



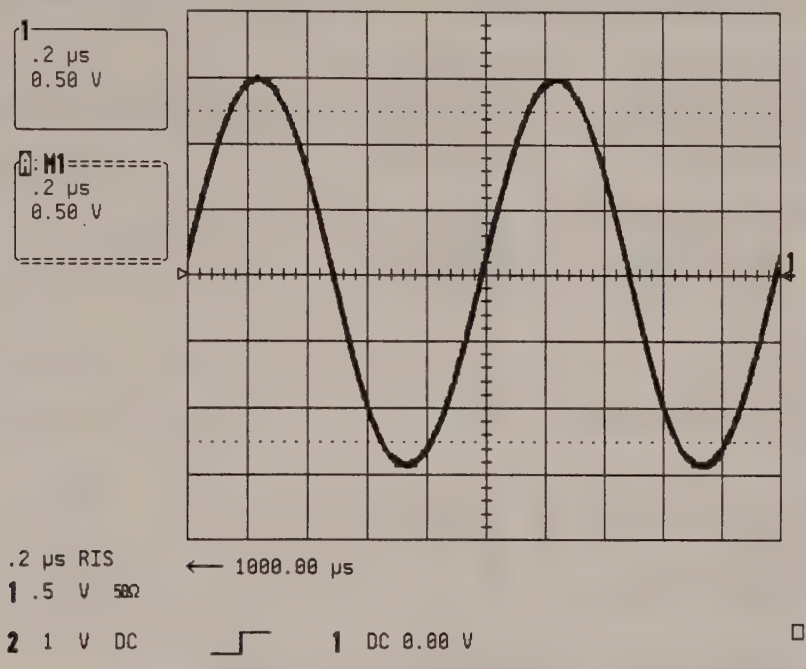
Store Channel 1 in memory 1.



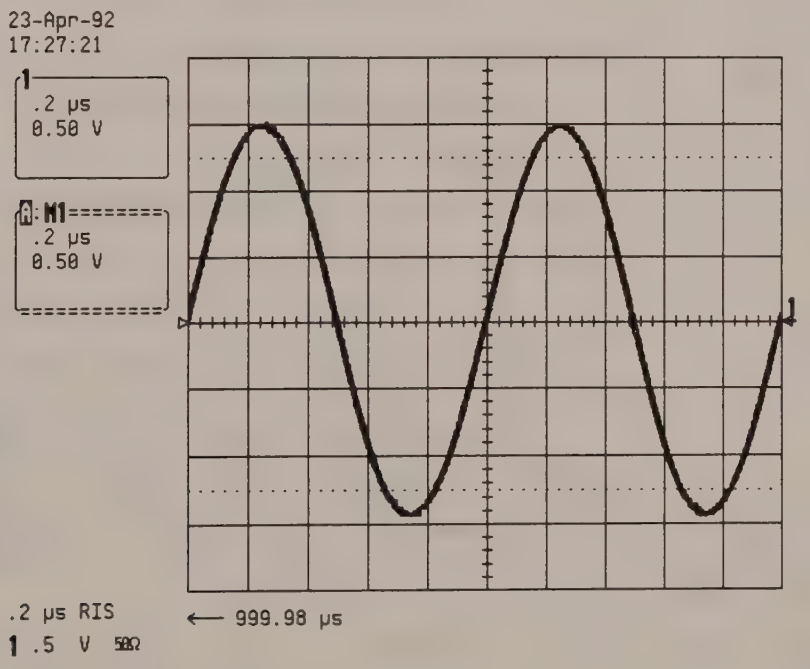
Set post-trigger delay to 1000.00 µs. This allows the accuracy of the time base clock to be checked 1000 periods after the trigger point.



Check that the displayed Channel 1 trace is aligned with the sine wave from memory 1.



A difference of ± 0.02 µs corresponds to ± 20 ppm.
See figure below



5.12 Overshoot Verification

Set up the DSO as follows :

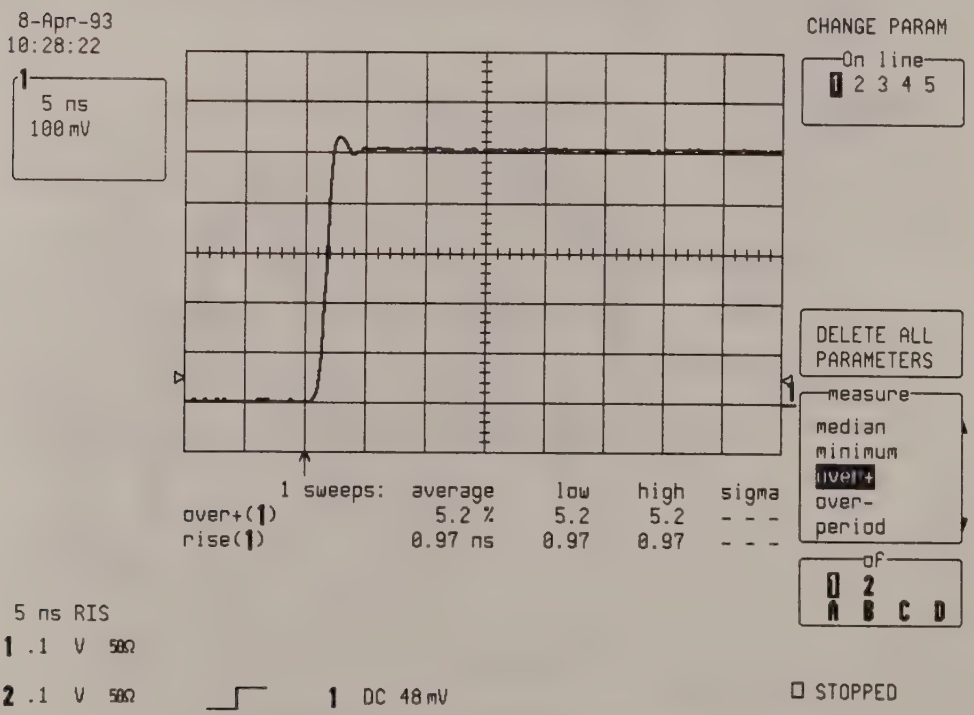
- Turn on trace : Channel 1
- Display setup : Standard, Persistence off, Single grid
- Input coupling : 50 Ohm DC
- Input gain : 100 mV/div.

- Trigger setup : Edge
  - Trigger on : Channel 1
  - Slope line : Positive
  - Mode : Norm

- Timebase : 5 ns/div
- Global BWL : Off
- Probe attenuator : X1

- Cursors/Measure : Parameters
- Mode : Custom
- Statistics : On
- Change Parameters :

  On line 1 : Measure over+ of Ch1
  On line 2 : Measure rise of Ch1



Apply the fast pulse generator LeCroy 4969 (< 700 ps) to Channel 1

Set the pulser to 61.05 µs

Check :

Overshoot must be 5% +/- 1%

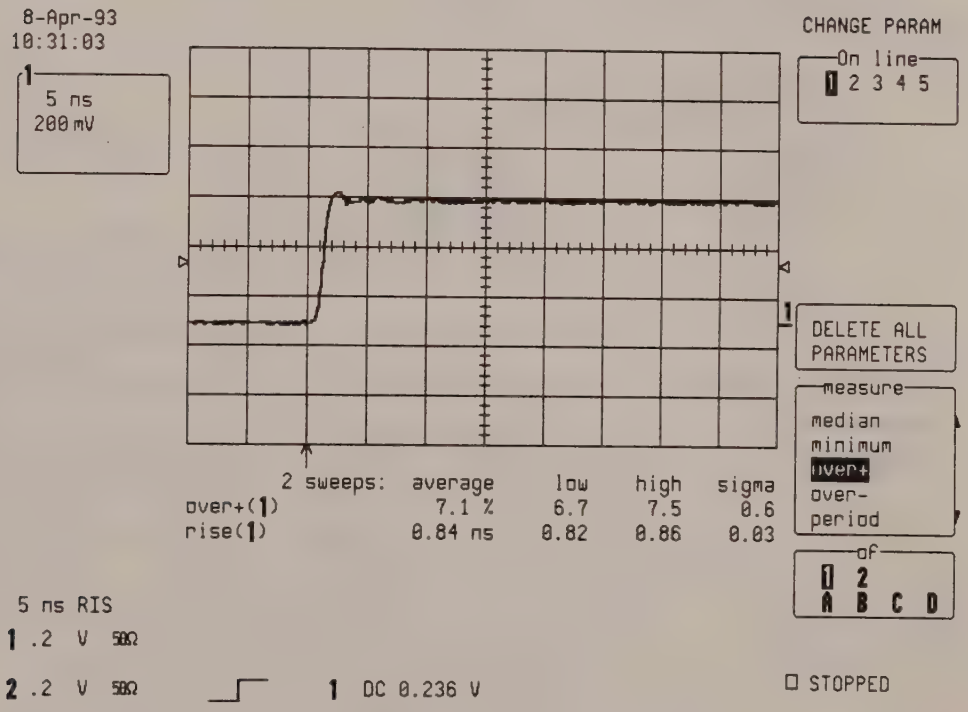
Risetime must be < 1.1 ns

- Select input gain : 200 mV/div

Check :

Overshoot is typically < 10%

Risetime < 1.1 ns



Repeat overshoot and risetime tests for Channel 2.

5.13 Probe Calibrator verification

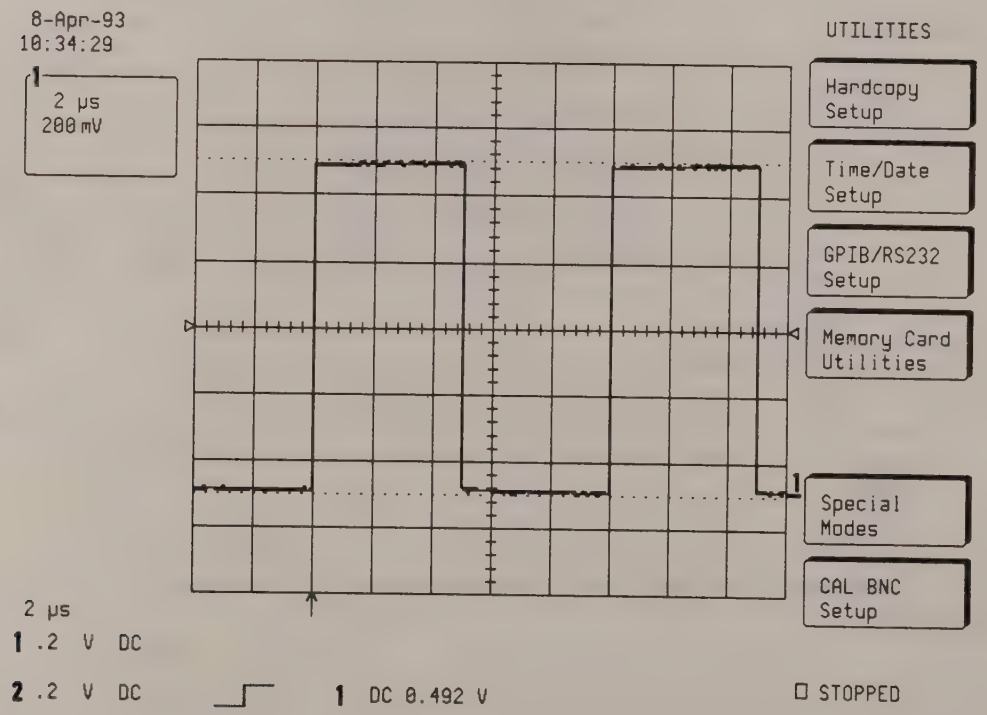
Set up the DSO as follows :

- Turn on trace : Channel 1
- Display setup : Standard, Persistence off, Single grid
- Input coupling : 1 MOhm, DC
- Input gain : 200 mV/div.

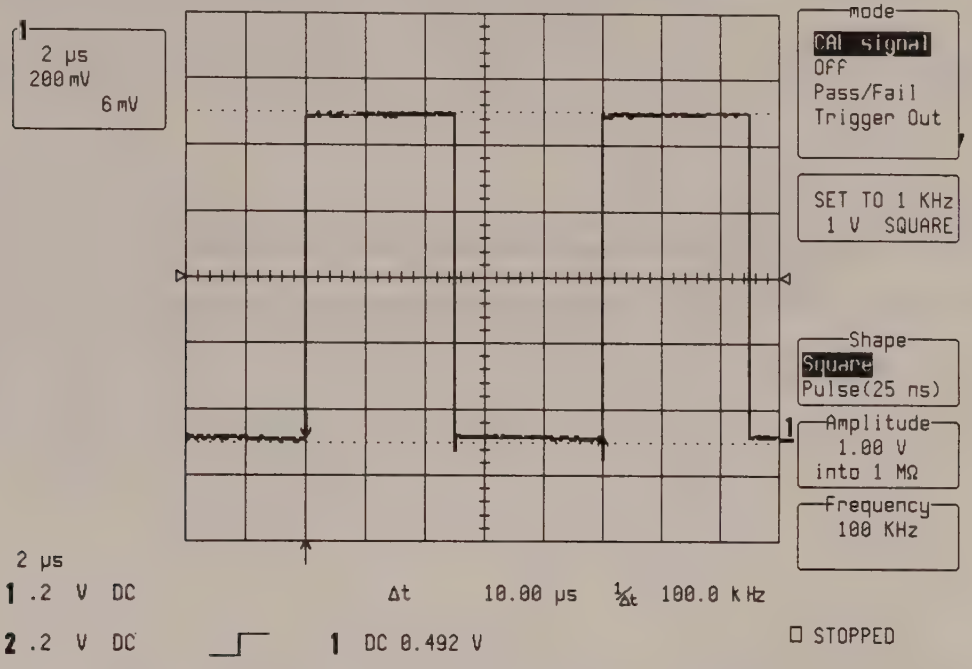
- Trigger setup : Edge
  - Trigger on : Channel 1
  - Slope line : Positive
  - Mode : Norm or Auto
  - Level : Zero mV
  - Delay : 10 %

- Timebase : 2 µs/div
- Global BWL : Off
- Probe attenuator : X1

- Select utilities
- Select Cal BNC setup
- Cal BNC out mode : Cal signal
- Shape : Square
- Amplitude : 1.00 V into 1 MOhm
- Frequency : 100 KHz



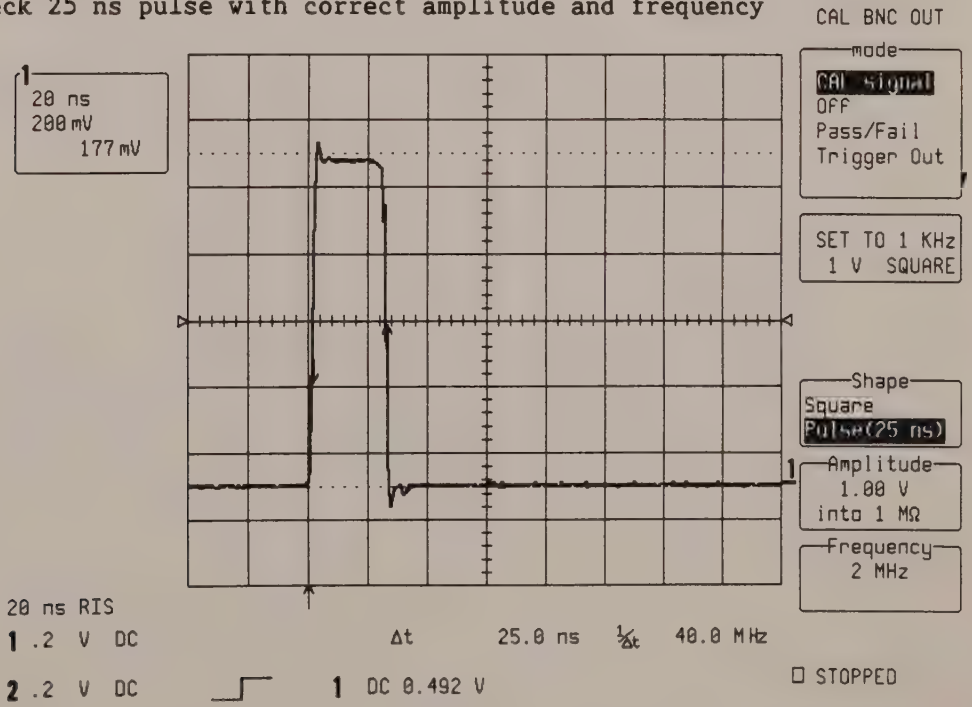
Connect Cal BNC out to Channel 1.
Check Square signal with correct amplitude and frequency (+/- 5%).



Check frequency range from 500 Hz to 2 MHz
Check amplitude range from .05 V to 1V

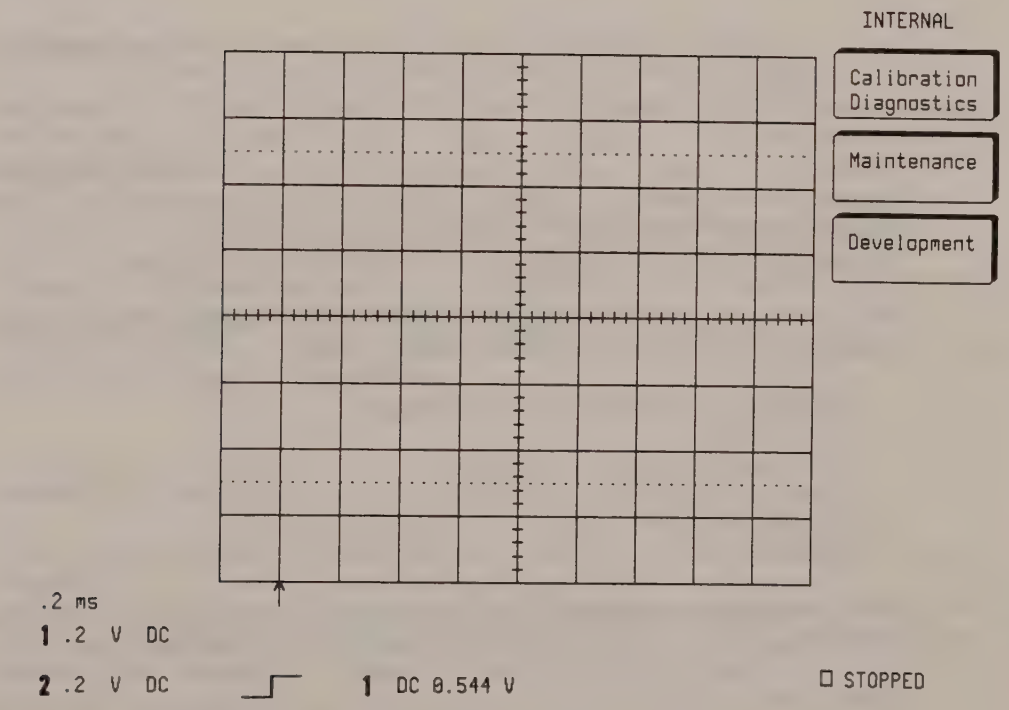
- Select Shape : Pulse (25 ns)
- Timebase : 20 ns/div

Check 25 ns pulse with correct amplitude and frequency

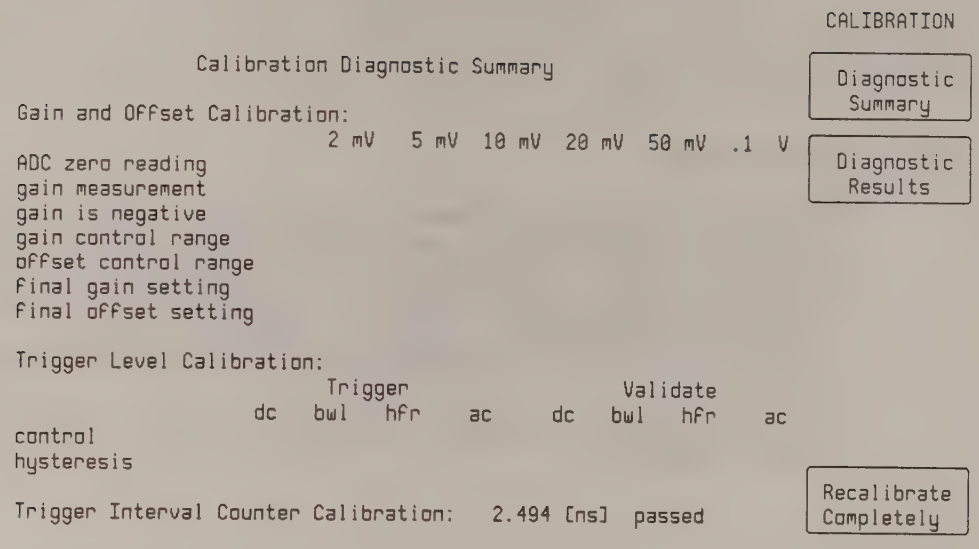


6.1 Introduction

The 9310 internal calibration and diagnostics menu is entered by simultaneously depressing the third and fourth menu push buttons on the right hand side of the CRT and then by depressing the fifth.
To quickly check the performance of the 9310 oscilloscope, select the calibration diagnostics, and press diagnostic summary.
Press the calibrate completely button to do a full recalibration of the front end.
It is advisable to perform this type of check when the scope is in a stable condition.



6.2 Diagnostic Summary



This is a handy tool to perform a quick but comprehensive internal performance check, without touching the acquisition settings. The failures are indicated by channel identifiers.
If no problem is detected, the fields are left blank.

The gain and offset results displayed for Channel 1 and Channel 2 are independent of the following conditions:

- 50 Ohm or 1 MOhm input impedance
- Time base
- Trigger mode and coupling
- BWL on or off
- Variable gain
- Offset

The internal calibration is checked at 1 MOhm, DC and for the six gain settings : 2 mV, 5 mV, 10 mV, 20 mV, 50 mV, 100 mV.

The five ranges 0.2 V, 0.5 V, 1 V, 2 V, 5 V are not calibrated.
The 50 Ohm input is not verified by the calibration.

6.3 Gain and Offset Calibration Description

ADC zero reading : For this test the DAC offset is set to zero. The variable calibration signal is changed until the ADC reads zero.

Gain measurement : The value of the variable gain is measured.

Gain negative : An error is displayed if negative gain is found.

Gain control range : This test verifies the range of the variable gain.

Offset control range : The range of the variable offset is checked.

Final gain setting : The variable gain and fixe gain is changed. The measurement is verified.

Final offset setting : Not yet implemented.

6.4 Trigger Level Calibration

The control of the trigger hysteresis is done in the trigger mode: DC, BWL on, HFr, AC, for the two trigger sections: trigger level and validate level.

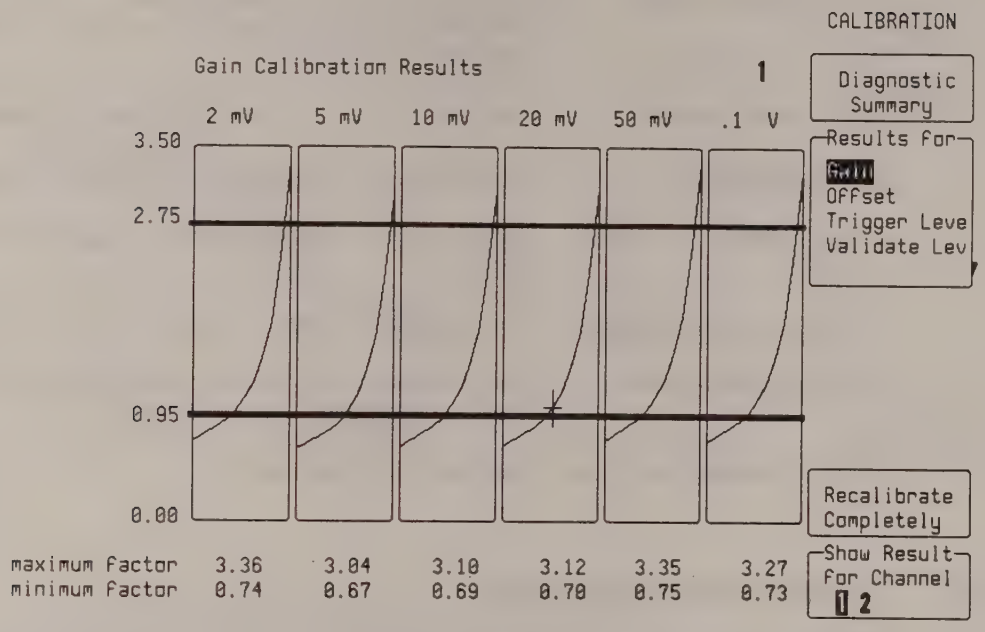
If an error occurred 1, 2 or E is displayed corresponding to Channel 1, Channel 2 or External trigger.
Trigger level corresponds to the MTR408 in LOC A5002, and validate level corresponds to the MTR408 in Loc A5001.
Trigger interval counter calibration must be passed if no trigger calibration error is detected.

6.5 Diagnostic Results

This menu displays the gain curves, offset curves of Channel 1, and Channel 2.
The tests allows the user to check whether the dynamic range of the programmable input amplifiers is sufficient, The trigger level is checked for Channel 1, Channel 2 and External trigger.

6.6 Gain Curves

Select Results for gain, and show result for Channel 1.



X = DAC range , from -10 V to +7.5 V

Y = Inverse of the gain

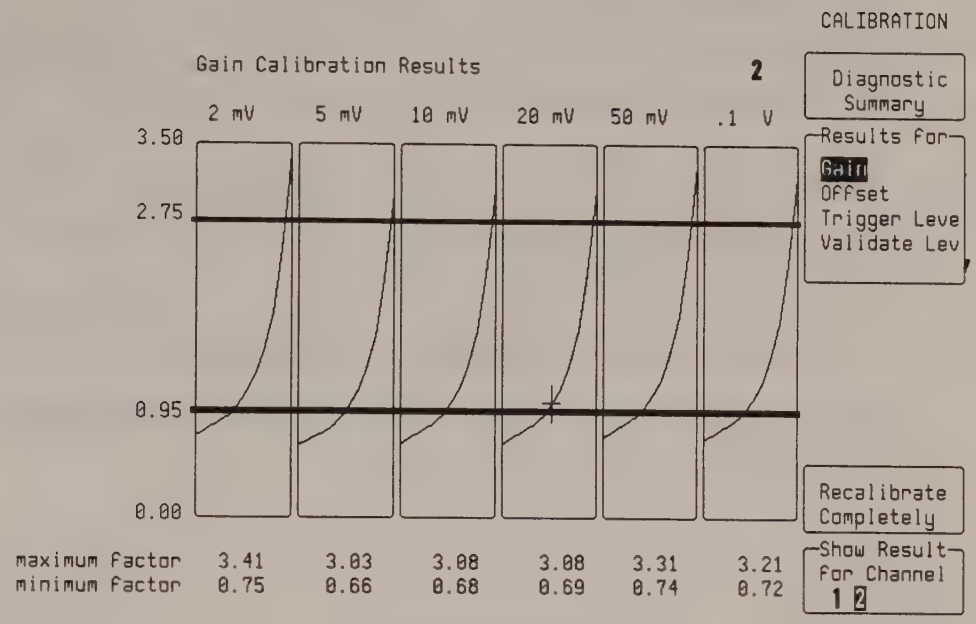
Variable gain range, checked by software must be better than 0.95 to at least 2.75 for the six displayed sensitivities.

With regard to the illustration, the lower portion of the curve must extend below the 0.95 limit, and the upper portion above the 2.75 limit.

The maximum and minimum factor is displayed for each range.

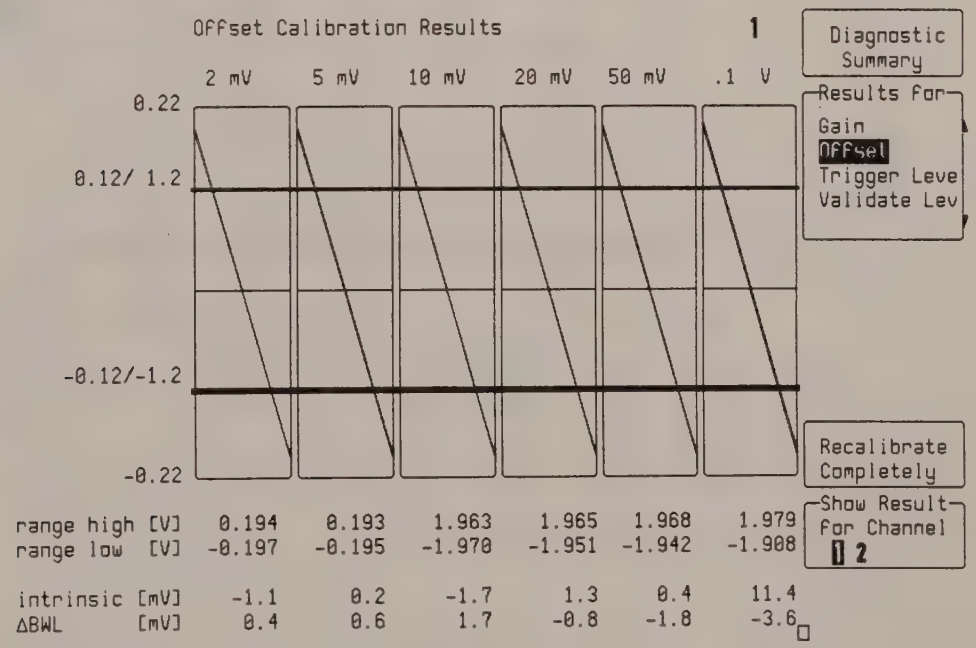
See front end calibration procedure for the variable gain adjustment.

Repeat the test for Channel 2.



6.7 Offset Curves

Select results for offset, and show result for Channel 1.



X = Offset DAC range, Y = Offset

The curves should be above the positive limits 0.12 V / 1.2 V and below the negative limits -0.12 V / -1.2 V.

For the sensitivities : 2 mV /div, 5 mV/div, a 1/10 attenuator is used, the limits are ± 0.12 V.

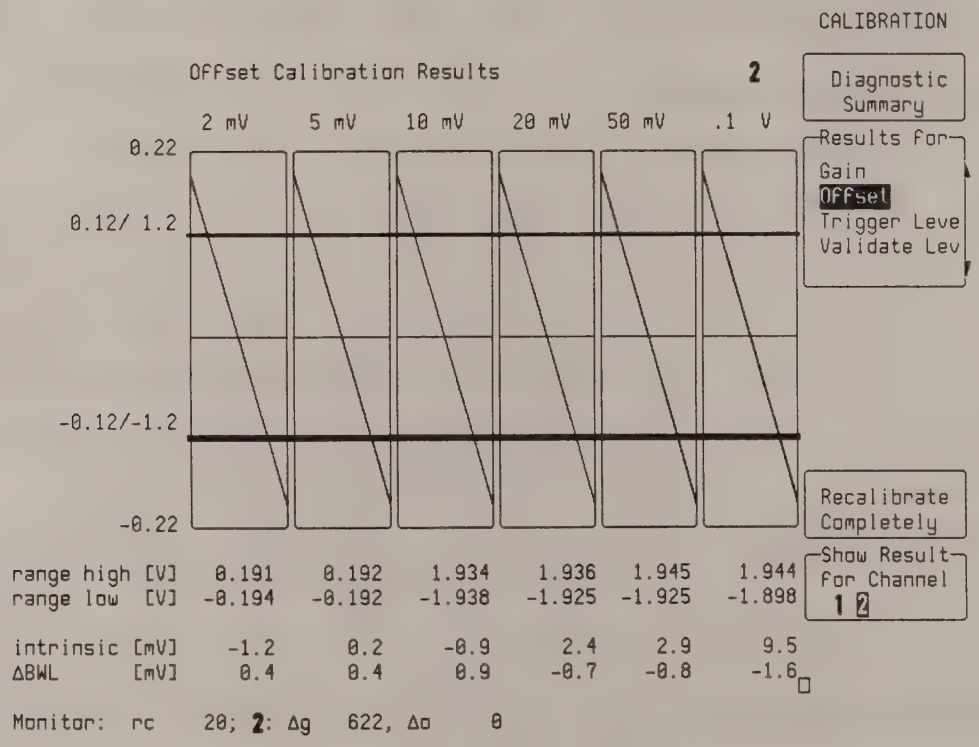
For the sensitivities 10 mV, 20 mV, 50 mV, 0.1 V/div, the limits are ± 1.2 V.

The maximum and minimum offset is ± 1.2 V. The calibration verifies that the DAC can reach this value.

The intrinsic value represents the offset in mV that should be applied to get zero offset to the ADC.

NB : Delta BWL is the difference between BWL on and BWL off.

Repeat the offset test for Channel 2.



6.8 Trigger Calibration

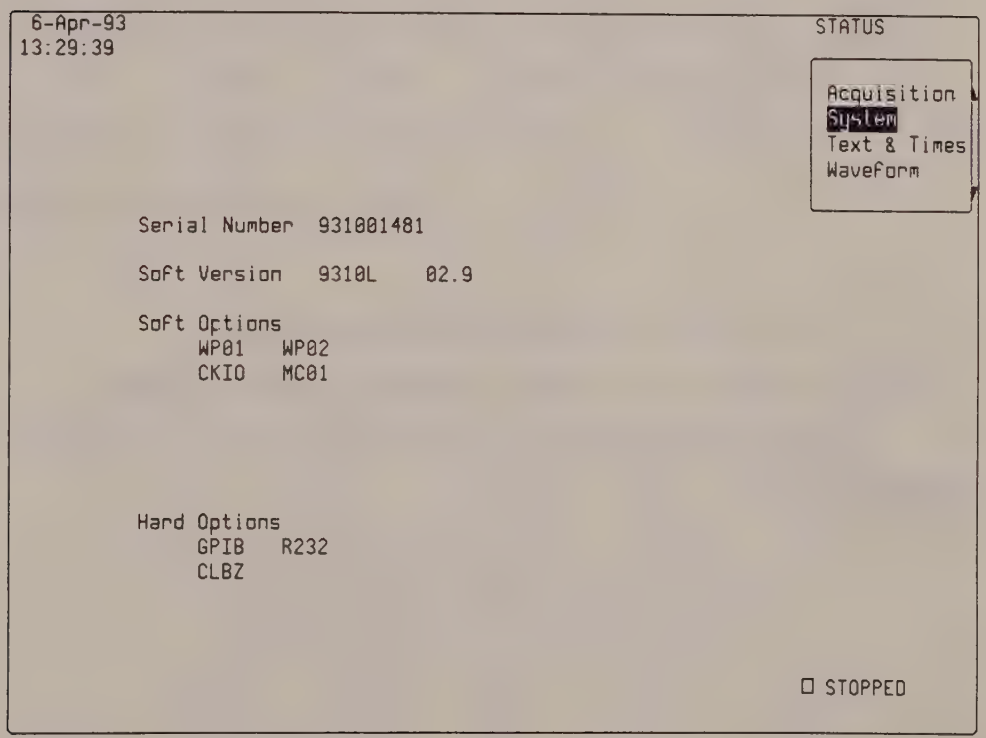
For Channel 1 and Channel 2 the trigger range is ± 5 divisions.
The hysteresis value is given in divisions. The positive and negative slope are displayed.
The difference between the two slopes represents the trigger hysteresis.

A zoom of the positive or negative hysteresis is displayed, the scale is ± 1 division. For the external trigger the hysteresis is in volt.

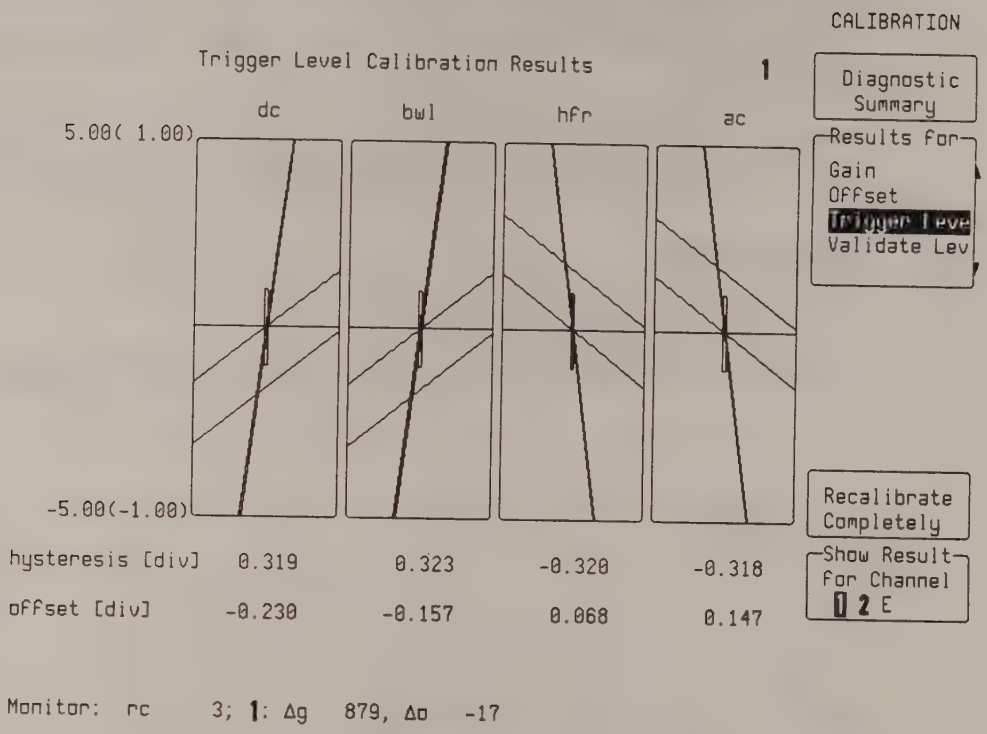
6.9 Trigger Level

6.9.1 9310/M/L with CLBZ hardware option

For F9310/M/L-3 base board revision F and G with CLBZ hard option



Select trigger level and show result for Channel 1.

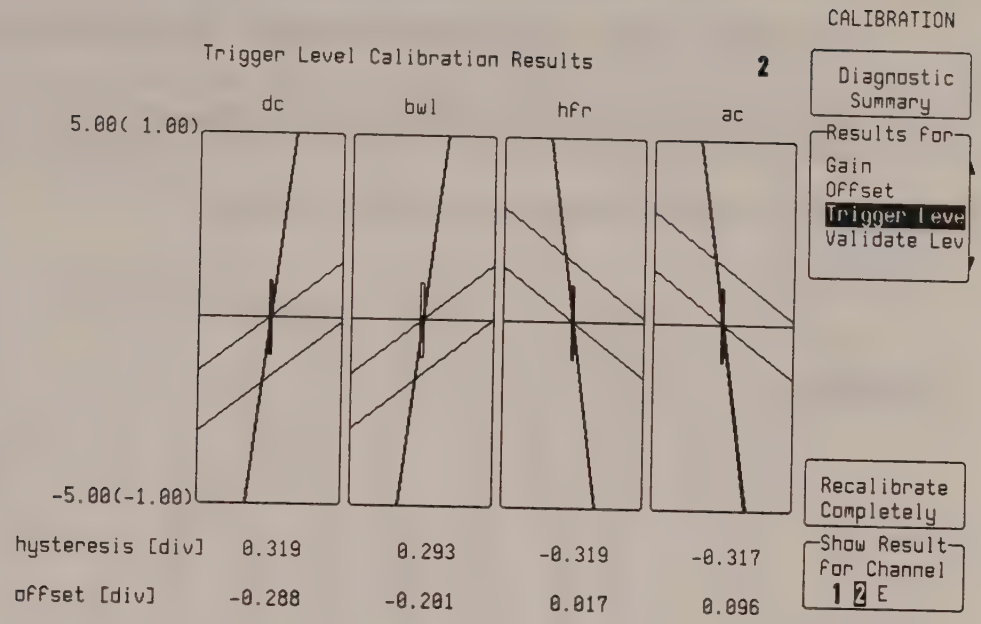


The hysteresis should be 0.35 div ± 0.05 div.

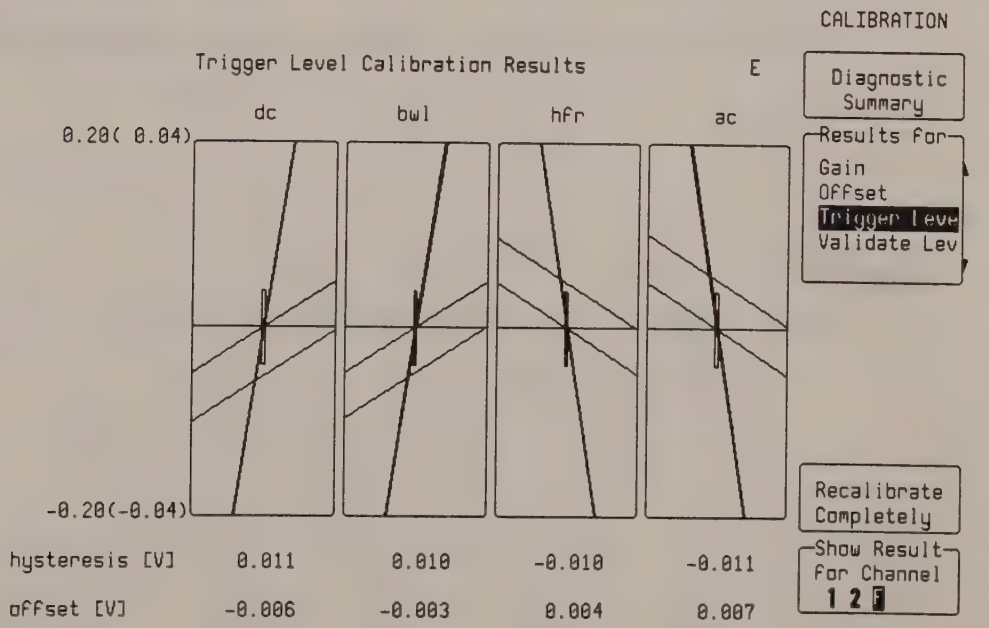
The offset of the positive slope is also mentioned.

The trigger adjustment is described in the front end calibration procedure, section 7.6.2.

Repeat the test for Channel 2.



Select show result for external.



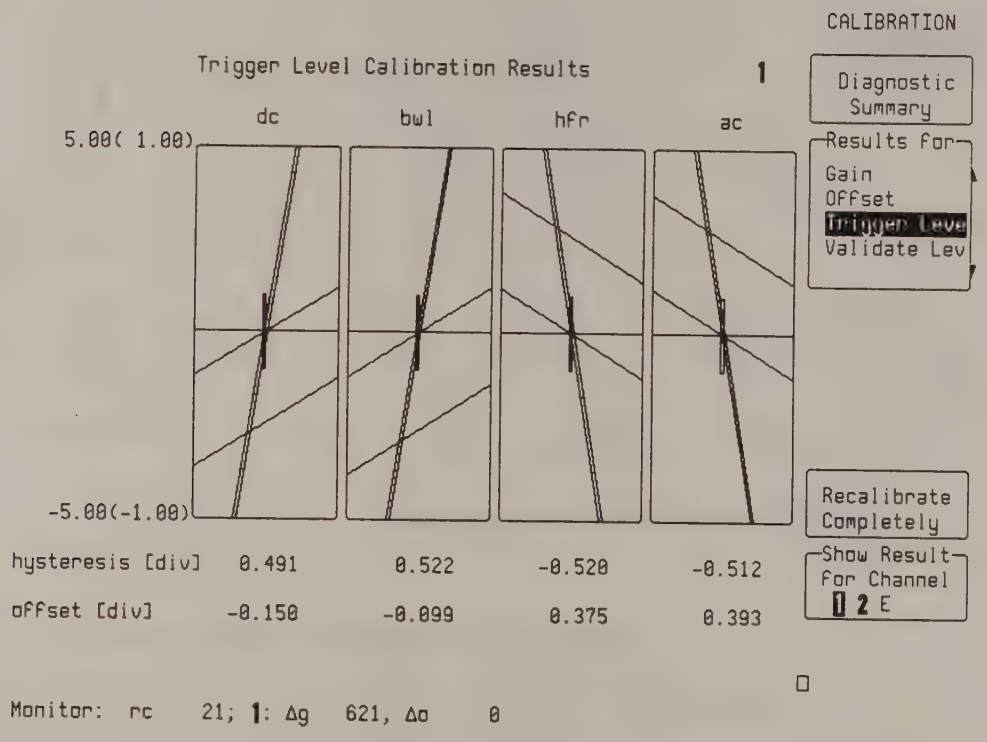
The hysteresis in volt should be 0.012 V ± 0.002 V.

6.9.2 9310/M/L with standard hardware option

For 9310/M/L DSO's with standard hardware option, F9310/M/L-3 base board revision C and D

Select trigger level and show result for Channel 1, then repeat the test for Channel 2.

the hysteresis should be 0.5 div ± 0.1 div



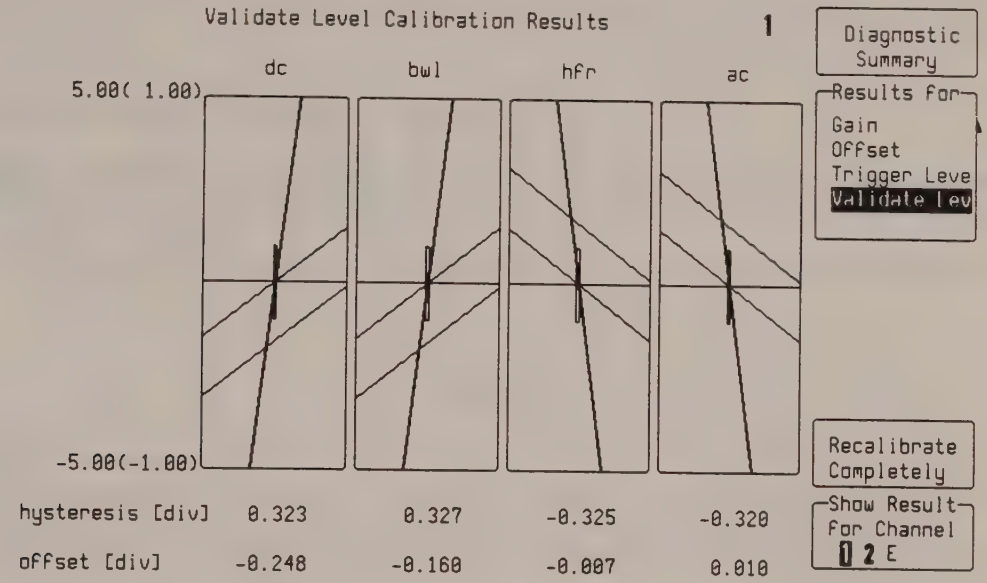
Select show result for external trigger.

The hysteresis in volt should be 0.02 V ± 0.005 V.

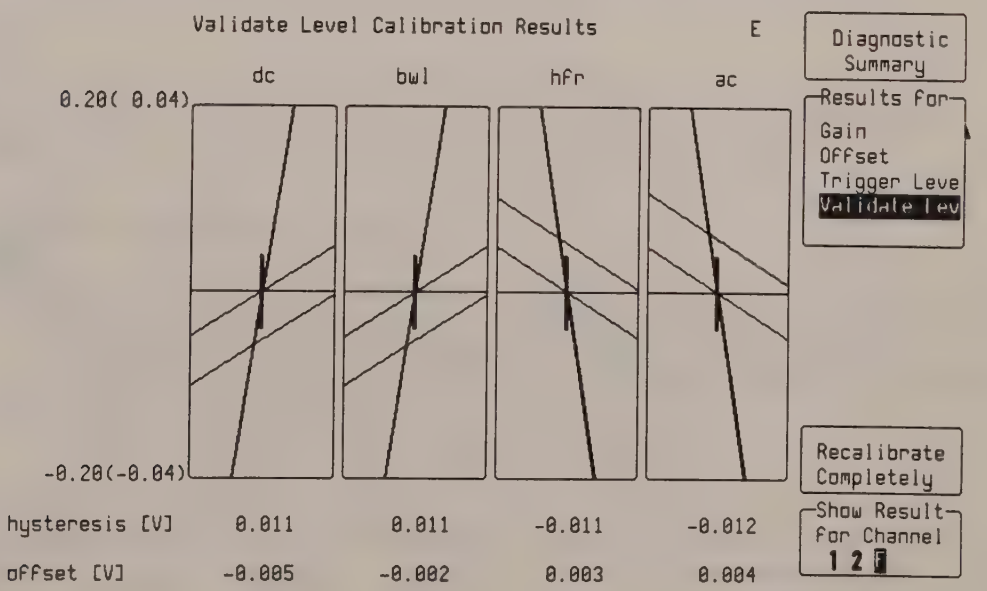
6.10 Validate Level

6.10.1 9310/M/L with CLBZ hardware option

For F9310/M/L-3 base board revision F and G with CLBZ hardware option the hysteresis in divisions should be 0.35 div ± 0.05 div.
Select validate level and show result for Channel 1, then repeat the test for Channel 2.

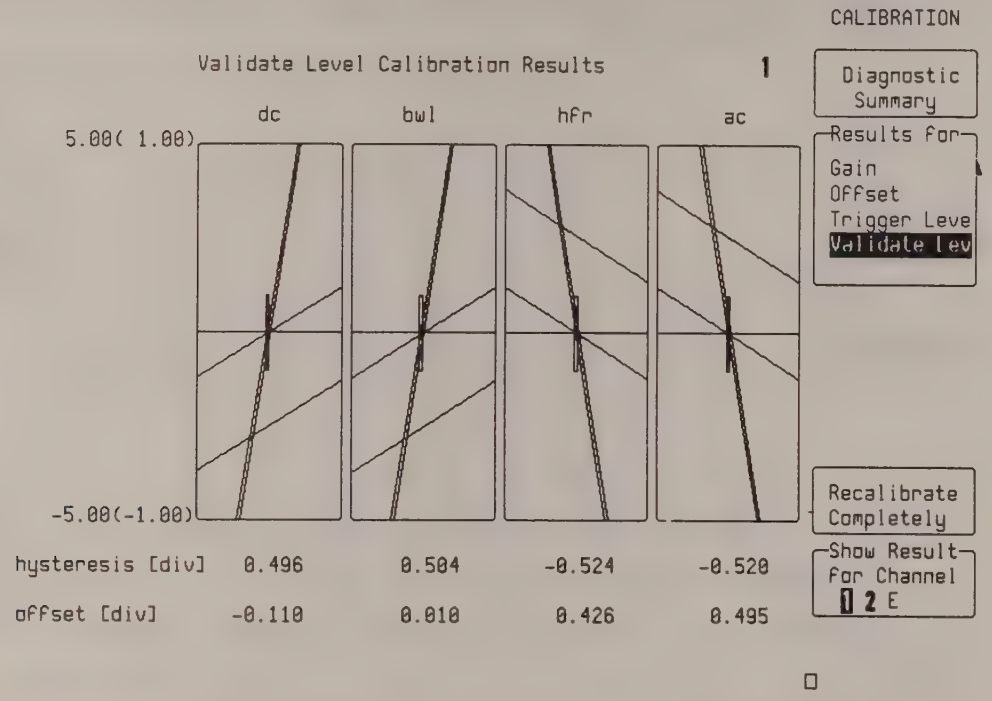


Select show result for external : hysteresis should be 0.012 V ± 0.002

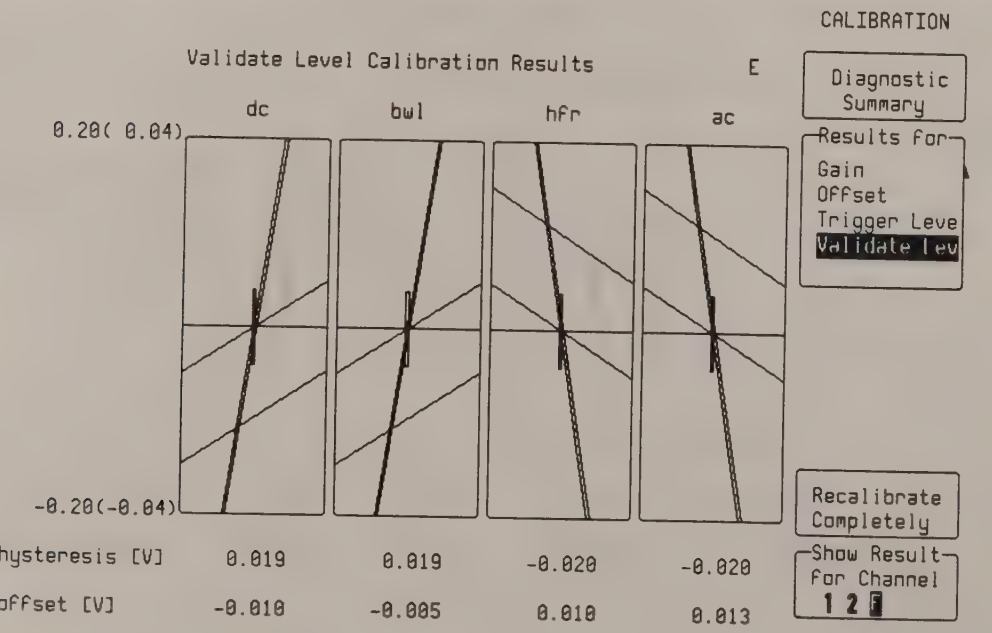


6.10.2 9310/M/L with standard hardware option

For F9310/M/L-3 base board revision C and D with standard hard option the hysteresis in divisions should be 0.50 div ± 0.1 div.
Select validate level and show result for Channel 1, then repeat the test for Channel 2.



Select show result for external : hysteresis should be 0.02 V ± 0.005



SECTION 7 MAINTENANCE

7.1 Introduction

This section contains information necessary to disassemble, assemble maintain, calibrate and troubleshoot the LeCroy 9310/M/L oscilloscope.

7.2 Disassembly and Assembly Procedure

The disassembly and assembly procedures detailed below refer to the assembly and disassembly diagram 7.2.1, and the view of figures 7.1, 7.2, 7.3 and 7.4.
Please study the diagram and figures before attempting disassembly.

WARNING

Before removing any parts from the LeCroy 9310/M/L be sure to read carefully the instructions referring to those parts, noting any precautions needed to avoid problems caused by mechanical behavior, high voltage supplies, etc.

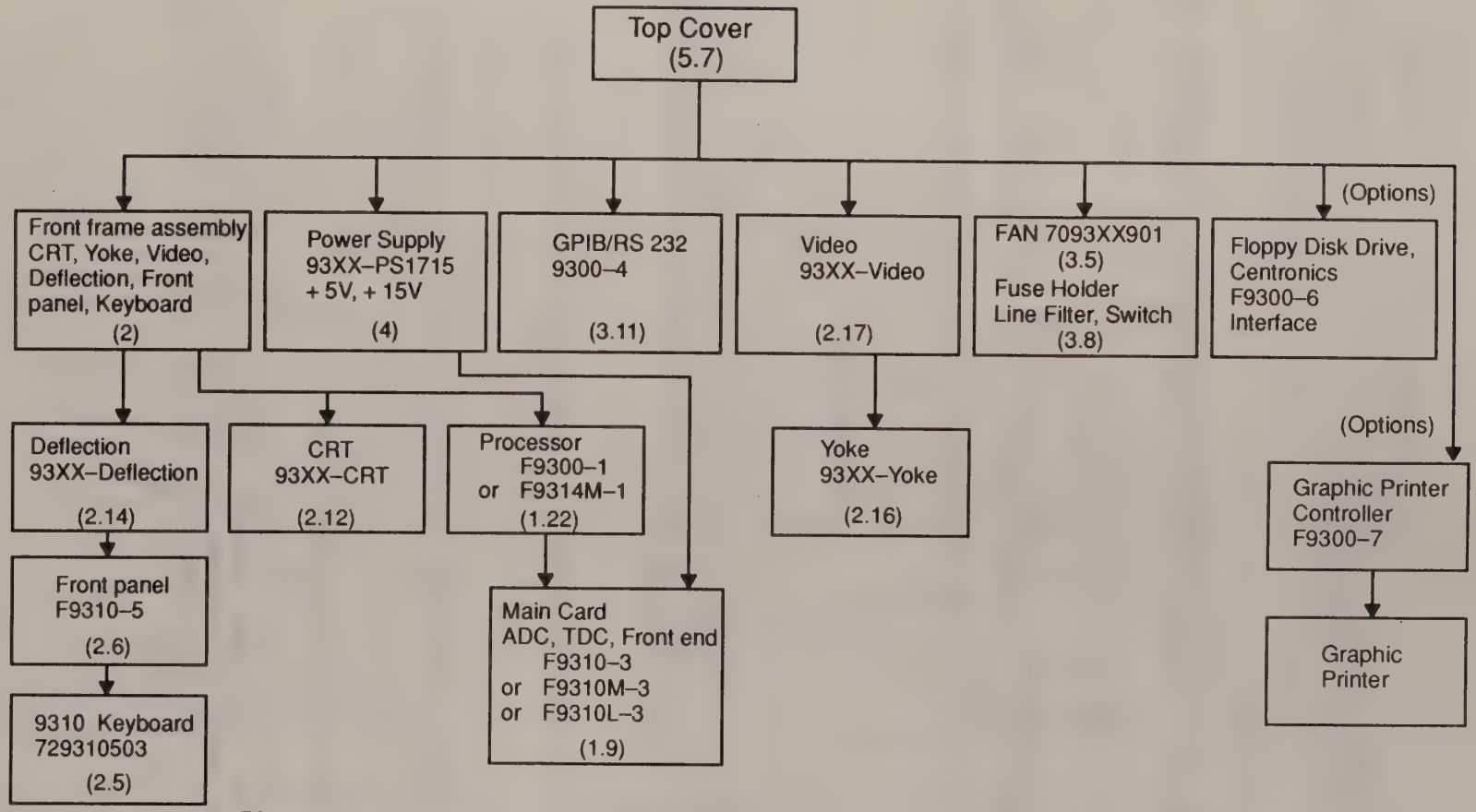
CAUTION

The usual precautions against static electricity are required, (see 1.10)

7.2.2 Removal of the Upper Cover (5.7)

The top cover (5.7) is secured by two M4x5 screws (5.9) on both sides of the front panel assembly (2), and by two M4x8 screws (5.8) on the rear panel (3). Remove the screws and carefully slide the cover off the unit to the rear. Removal of the top cover gives access to the boards and parts listed in section 7.2.1.

7.2.1 Disassembly and Assembly Diagram



Disassembly: If it becomes necessary to replace a board or a part, use the disassembly diagram to disassemble the unit. Any board can be removed only if any items higher in the diagram and connected by a line are already out.

Assembly: Reassemble the unit in the reverse order.

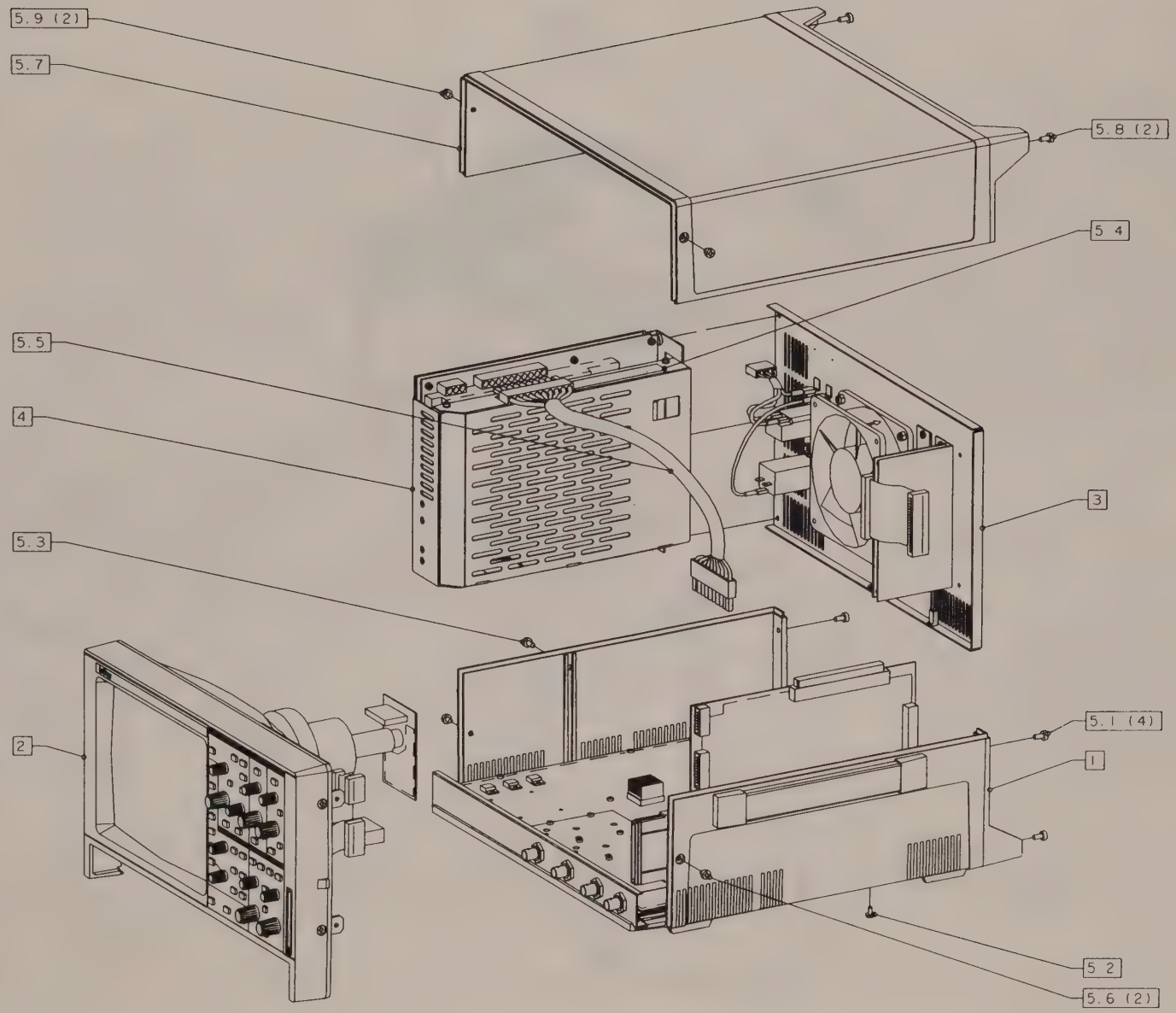


FIGURE 7.1: 9310 DSO EXPLODED VIEW

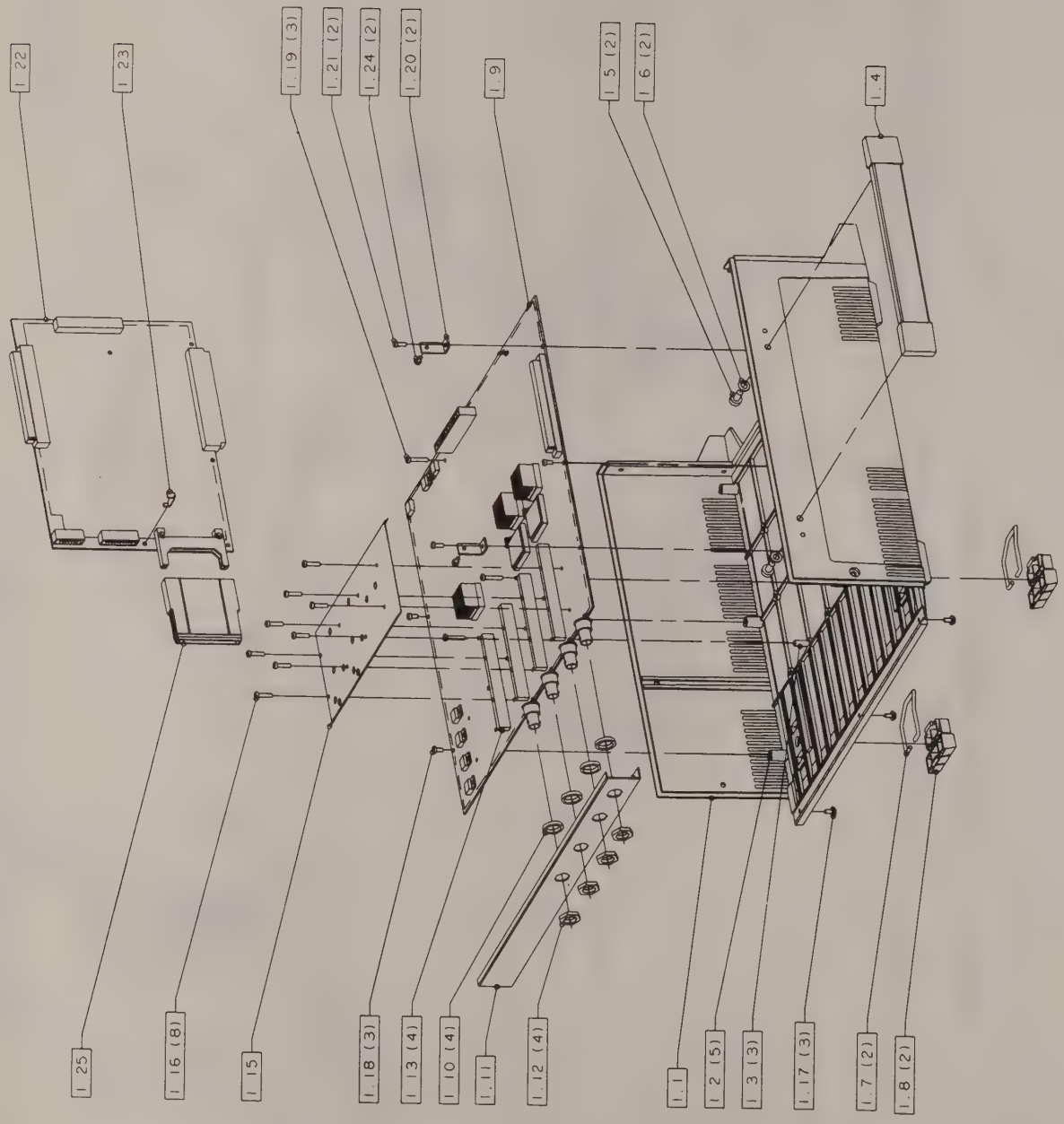


FIGURE 7.2: 9310 LOWER COVER EXPLODED VIEW

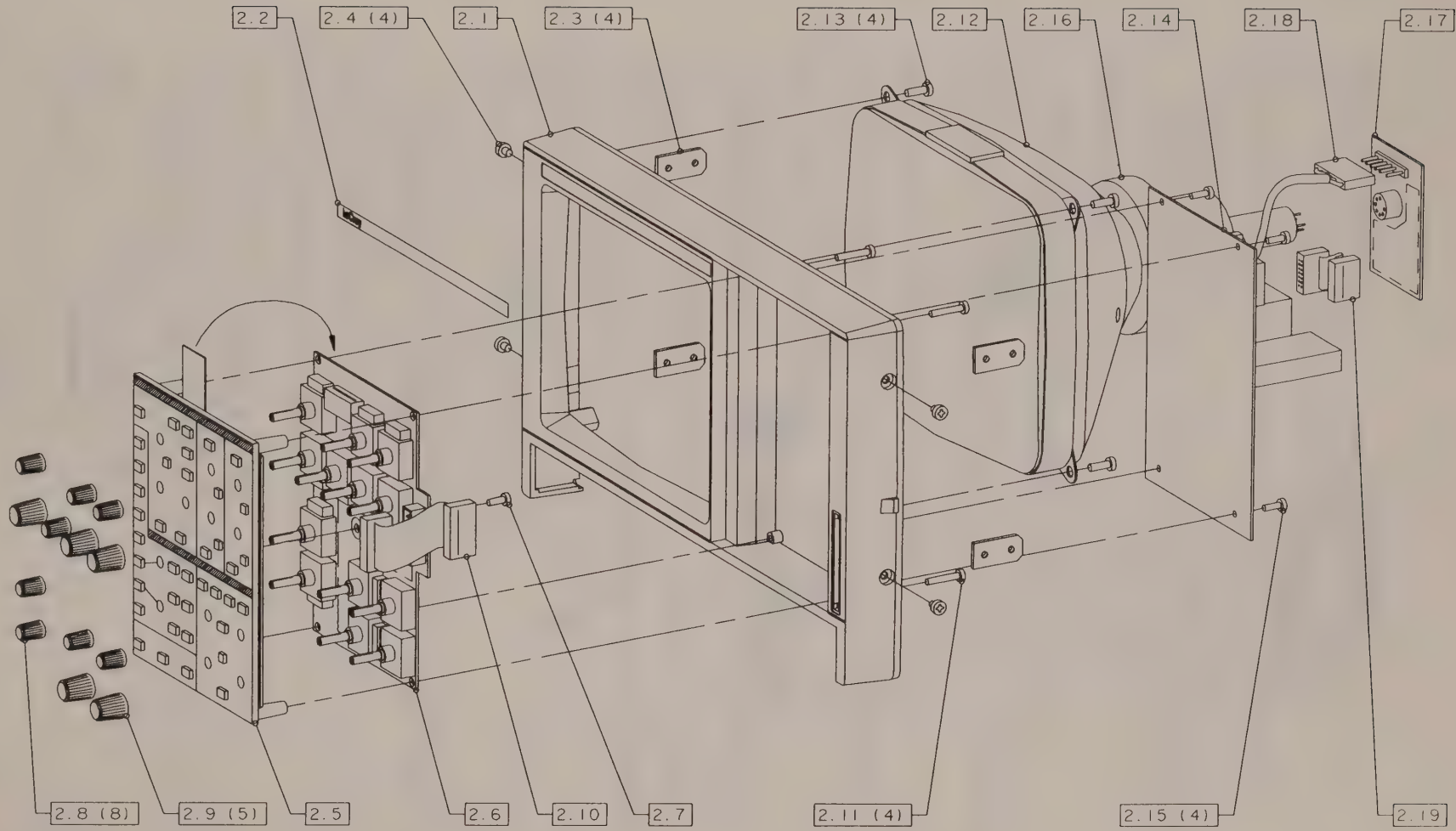


FIGURE 7.3: 9310 FRONT FRAME EXPLODED VIEW

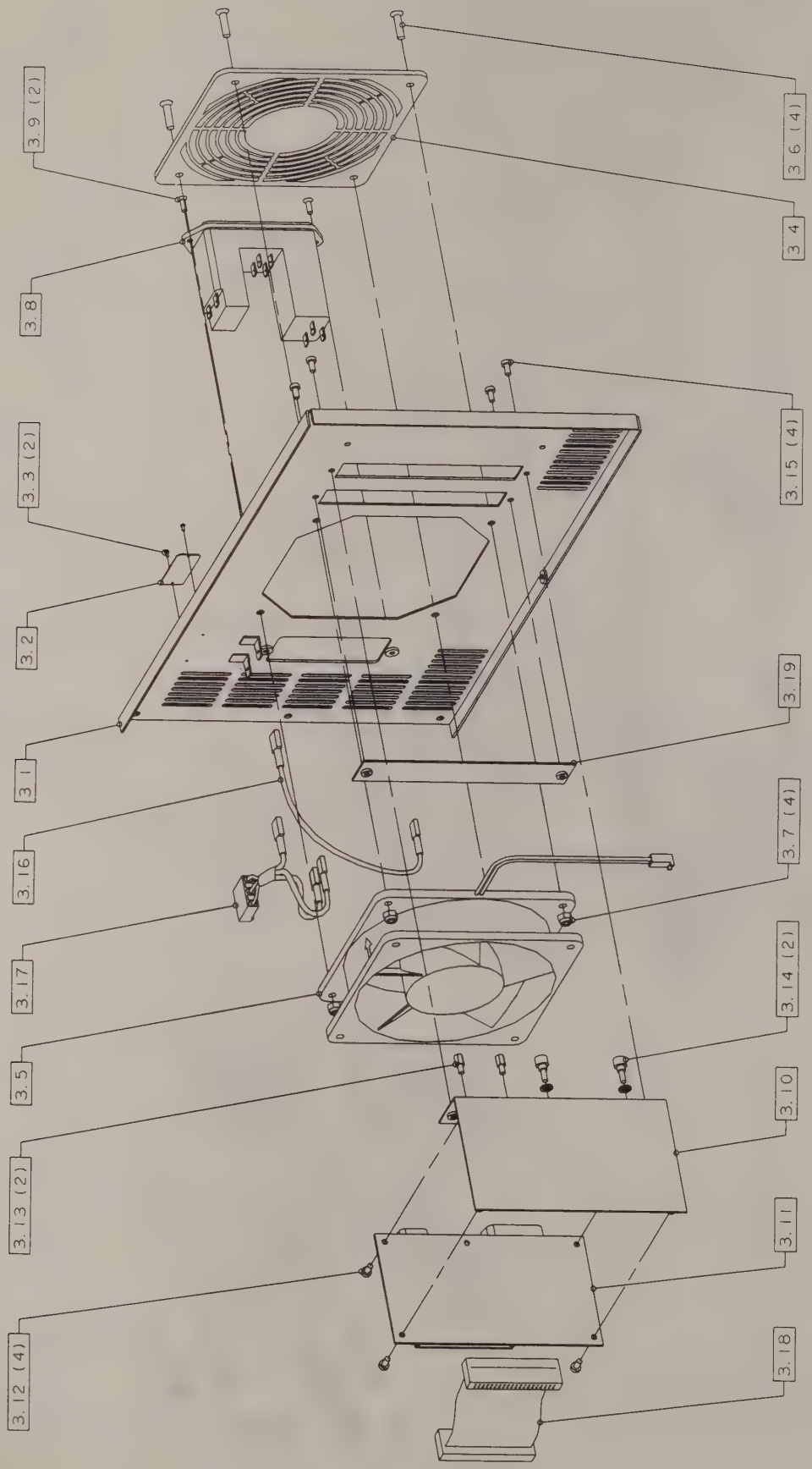


FIGURE 7.4: 9310 REAR PANEL EXPLODED VIEW

7.2.3 Removal of the 93XX-PS 1715 Power Supply (4)

W A R N I N G

Ensure the line cord is disconnected. Remove the following:

- Top cover (7.2.2).
- One M4X8 screw (5.3) from left side of the bottom cover (1).
- Two M4X8 screws (5.1) from left side of the rear panel (3).

Disconnect the following:

- Base card power cable (5.5) from connector J2.
- PS1715 line input cable (3.17) from connector J6.

The power supply can now be removed vertically from the oscilloscope.

7.2.4 Removal of the F9300-4 GPIB/RS232 Interface (3.11)

The GPIB/RS232 interface (3.11) is vertically mounted on the rear panel (3.1).
Remove the following:

- Top cover (7.2.2).
- Two M3x6 screws (3.15) and washers from the rear panel (3.1).

Disconnect the flat cable (3.18) from the processor board (1.22) connector J5.
The GPIB/RS232 board can be removed forwards from the rear panel.

7.2.5 Removal of the Fan (3.5)

Remove the following:

- Top cover of 9310 (7.2.2)
- Four screws (3.6) and nuts (3.7) from the rear panel (3.1).
- Disconnect the fan power cable from the main card F9310-3 connector J3.
- Remove the fan grid (3.4).

The fan (3.5) can be removed from the unit.

C A U T I O N

Note the air flow, the fan extracts air from the unit and expels it.

7.2.6 Removal of the Fuse Holder

W A R N I N G

Disconnect the power cord.
Remove the following:

- Top cover (7.2.2).
- Two screws (3.9) from the rear panel.
- Disconnect the power cable (3.17) from the power supply connector J6.
- Disconnect the earth cable (3.16).

The fuse holder assembly (3.8) can be removed from the rear panel (3.1).

7.2.7 Removal of the 93XX-Video (2.17)

- Remove the top cover (7.2.2).
- Disconnect the ground cable from CRT (black wire)
- Disconnect the monitor cable (2.18) from the deflection board, connector W202 and W203.

Ease the video board (2.17) carefully toward the back of the DSO, until it is free.

7.2.8 Removal of the 93XX-Yoke (2.16)

- Remove the top cover (7.2.2).
- Remove the 93XX-video board (7.2.7)
- Disconnect the cable from the deflection board connector W201.
- Loose the screw on the yoke ring holder.

The deflection yoke (2.16) can be removed from the cathode ray tube (2.12).

7.2.9 Removal of the front frame Assembly (2)

Remove the following:

- Top cover (7.2.2)
- Two screws (5.6) that secure the front frame assembly (2) to the lower cover (1).
- Disconnect the front panel flat cable (2.10) from the processor board (1.22) connector J4.
- Disconnect the deflection flat cable (2.19) from the processor board (1.22) connector J6.

The front frame assembly (2) with the CRT (2.12), yoke (2.16), video (2.17), deflection (2.14), front panel (2.6) and keyboard (2.5) can with care be removed forward from the unit.

C A U T I O N

Hold the CRT very carefully, or place soft padding under it.

7.2.10 Removal of the 93XX-Deflection (2.14)

The deflection board (2.14) is situated to the back of the front panel (2.1).

Remove the following

- Top cover (7.2.2).
- Front frame assembly (7.2.9).
- Disconnect the monitor cable (2.18) which lead to the video board (2.17), connector W202 and W203.
- Disconnect the cable from the deflection yoke, connector W201.
- Disconnect the EHT plug from the receptable at the right side of the CRT (2.12).

W A R N I N G

Touch the free end of the EHT cable to the ground, this ensures that no significant charge remains. The CRT must be discharged similarly, using a tool or a long screw driver which is first placed to the ground and on the CRT receptable.
Remove the four M35x10 screws (2.15) that secure the deflection board to the plastic front frame. The board (2.14) can now be removed from the unit.

7.2.11 Removal of the 93XX-CRT (2.12)

It is necessary to remove the front frame assembly (7.2.9). The CRT is secured to the plastic front frame by four screws (2.13).

- Remove the 93XX-video (7.2.7).
- Remove the 93XX-yoke (7.2.8).
- Disconnect the EHT cable from the deflection board.
- Discharge the tube.
- Remove the four screws.

The CRT can now be removed from the front frame.

W A R N I N G

Use care when handling the CRT. Avoid striking it on any object which may cause the tube to implode. Store the cathode ray tube face down on a soft surface.

To avoid electrical shock the CRT should be discharged after the 9310 oscilloscope is powered OFF. After disconnecting the EHT plug ground the CRT anode lead to the metallic display support repeat the operation to fully dissipate the charge.

7.2.12 Removal of the F9310-5 Front Panel (2.6)

Remove the following:

- Upper cover (7.2.2).
- Front frame assembly (7.2.9).
- 93XX-deflection board (7.2.10).
- Four screws (2.11) that secure the front panel.

The front panel (2.6) with the keyboard (2.5) can be removed forward from the unit.

7.2.13 Removal of the 9310 Keyboard (2.5)

Remove the following:

- Upper cover (7.2.2).
- Front frame assembly (7.2.9).
- 93XX-deflection board (7.2.10).
- F9310-5 front panel (7.2.12).
- The 11 rotary knobs (2.8 and 2.9).

C A U T I O N

Take great care of the soft plastic.

- One screw (2.7) that secures the keyboard to the front panel.
- Disconnect the flat ribbon cable from the front panel connector J2.

C A U T I O N

When removing or installing the keyboard or the front panel, be careful of the fragile flat ribbon cable and connector.

7.2.14 Removal of the F9300-1 or F9314M-1 Processor (1.22)

The processor board is located along the right side of the instrument.

Remove the following:

- Top cover (7.2.2).
- Front frame assembly (7.2.9).
- Two M3x6 screws (1.24) and washers that secure the processor to the brackets (1.20).
- Disconnect the flat cable (2.19) from the F9300-4 GPIB interface connector J5. The processor can be removed vertically from the main card (1.9) F9310-3 connector J1.

C A U T I O N

Static electricity can damage components (RAM, Eproms, microprocessor...). Antistatic precautions are required.

7.2.15 Removal of the F9310/M/L-3 Main Card (1.9)

Remove the following:

- Top cover (7.2.2).
- Front frame assembly (7.2.9).
- Power supply (7.2.3).
- Processor (7.2.14).

The main board is horizontally mounted to the lower case cover (1.1) and secured by three M3x6 screws (1.18), two M3x8 screws (1.21), three M3x16 (1.19) and three M3x6 flat head screws (1.17).

- Remove the eleven screws and two brackets (1.20)
- Disconnect the fan cable from connector J3. The main board can be removed from the scope.

C A U T I O N

Antistatic precautions are required.

7.2.16 Removal of the Handle (1.4)

The handle with two black end caps is secured to the right side of the lower cover (1.1) by two screws (1.5) and washers (1.6).
- Remove the upper cover (7.2.2), processor board (7.2.14).

The handle can be removed from the lower case.

7.2.17 Removal of the Foot Support (1.8)

The two foot supports are clipped on the lower cover (1.1).
Remove the foot (1.7) or the support (1.8) by inserting a small flat screwdriver under the support

7.2.18 Removal of the 93XX-FD01 Floppy Disk Drive Option

- Remove the upper cover (7.2.2).
- Disconnect the flat ribbon cable from the F9300-6 interface (see figure 7.5).
- Remove the two M3x6 screws that secure the floppy drive support to the upper cover.
- Remove the support 70FD01021 and frame 70FD01031 from the cover.
- Remove the four M2.5x4 screws that secure the floppy to the support

The floppy disk drive can be removed from the frame

7.2.19 Removal of the 93XX-GP01 Graphic Printer and F9300-7 Controller Option

- Remove the upper cover (7.2.2).
- Disconnect the power cable (780210030) from the 93XX-PS1715 power supply (see figure 7.6).
- Disconnect the flat ribbon cable (780791604) from the F9300-7 controller (see figure 7.6).
- Disconnect the flat ribbon cable (780721022) between the F9300-6 interface and F9300-7 controller.
- Remove the four M3x6 screws that secure the F9300-7 controller to frame (70GP01031).
- Remove the F9300-7 controller
- Remove the two M3x6 screws that secure the printer to the frame

The graphic printer can now be removed from the upper cover.

7.2.20 Removal of the F9300-6 Centronics Interface Option

- Remove the upper cover (7.2.2).
- Remove the two M3x6 screws from the rear panel
- Disconnect the flat cable from the F9300-4 GPIB/RS232 board (see figure 7.5 or 7.6).

The graphic printer, floppy disk drive, and centronics interface board can be removed forward from the rear panel.

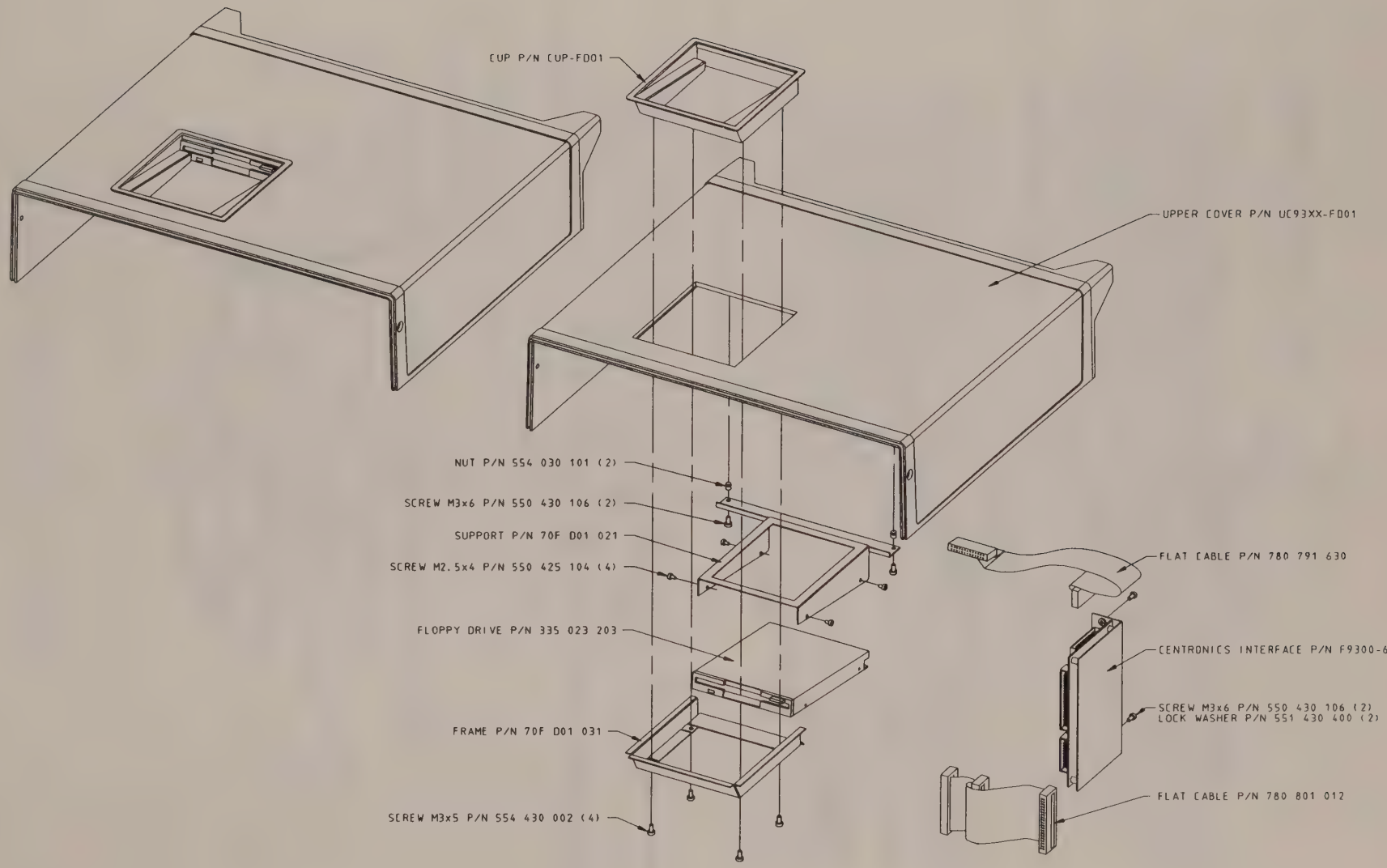


FIGURE 7.5: 93XX-FD01 OPTION ASSEMBLY

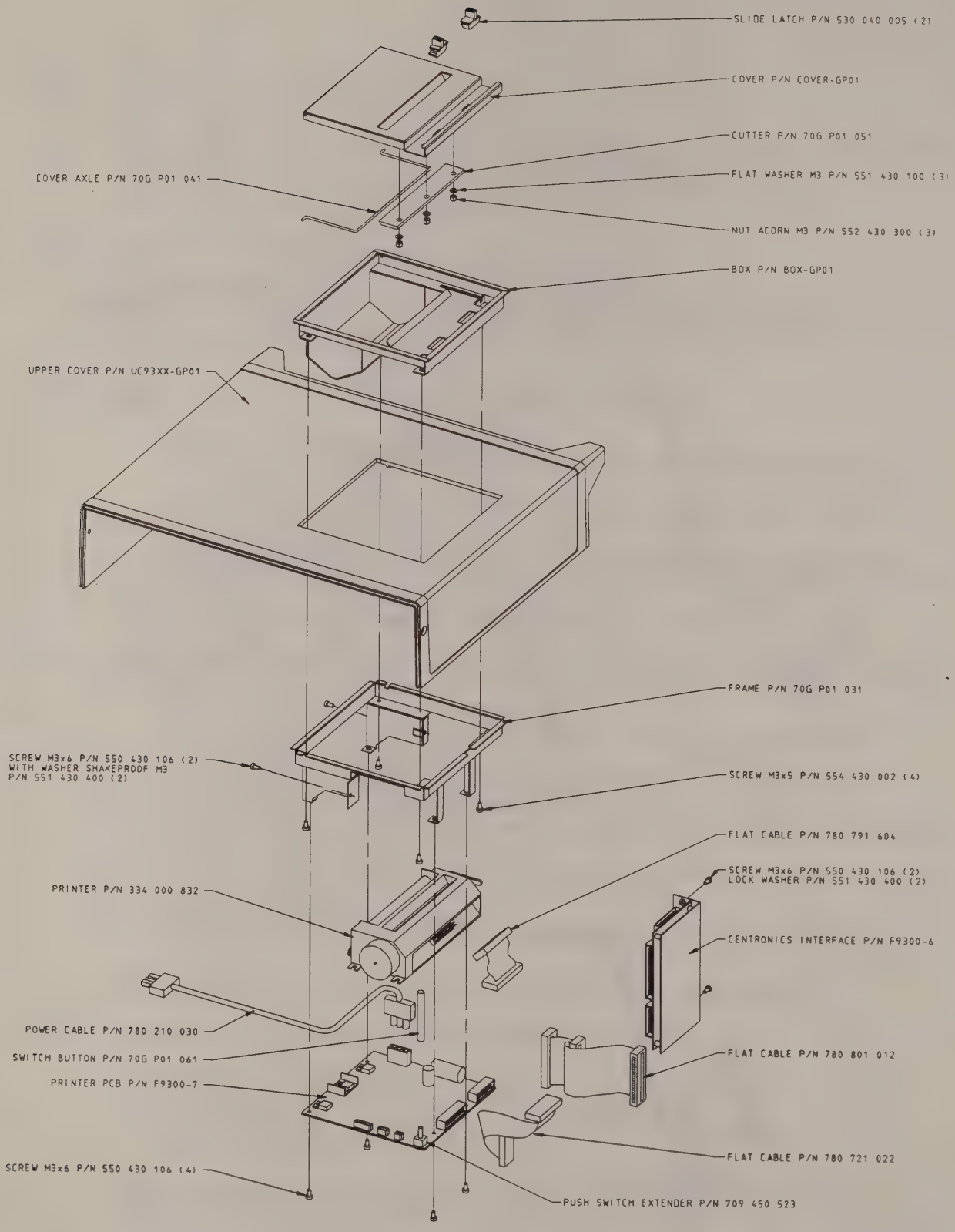


FIGURE 7.6: 93XX-GP01 OPTION ASSEMBLY

7.3 Software Upgrade Procedure

The processor board carries the program memory (768 Kbytes) contained in four Eproms (Loc A22, A27, A29, A38), the character font Eprom (Loc A1) used by the graphic processor of the raster scan display, and the software option selection GAL (Loc A19). After any software change, a general instrument reset is mandatory. Simultaneously press the autosetup button, the top menu button and the return button.

7.3.1 Upgrading Firmware

LeCroy Corporation has a policy of continually improving and upgrading its products. The firmware can be upgraded to the latest version by changing the four Eproms 1H, 1L, 2H, 2L on the processor board at locations A22, A27, A29 and A38 (see figure 7.7). Access is possible by removing the upper cover (7.2.2).
The Eproms can be removed by using an IC extractor. Make sure that the guiding notch in the chip is aligned with the PCB. Same procedure for the character font Eprom at location A1.

7.3.2 Changing Software Options

The software option selection GAL is located on the processor board at location A19 (see figure 7.7). Insert or replace the GAL to select new options.
Make sure that the orientation notches are correctly aligned with the PCB.

7.3.3 Software Option Selection GAL

As of today the following software options are available:

0000:	Standard	GAL not necessary
0001:	WP01	Advanced Math package
0002:	WP02	Basic FFT package
0200:	CARD	Memory card

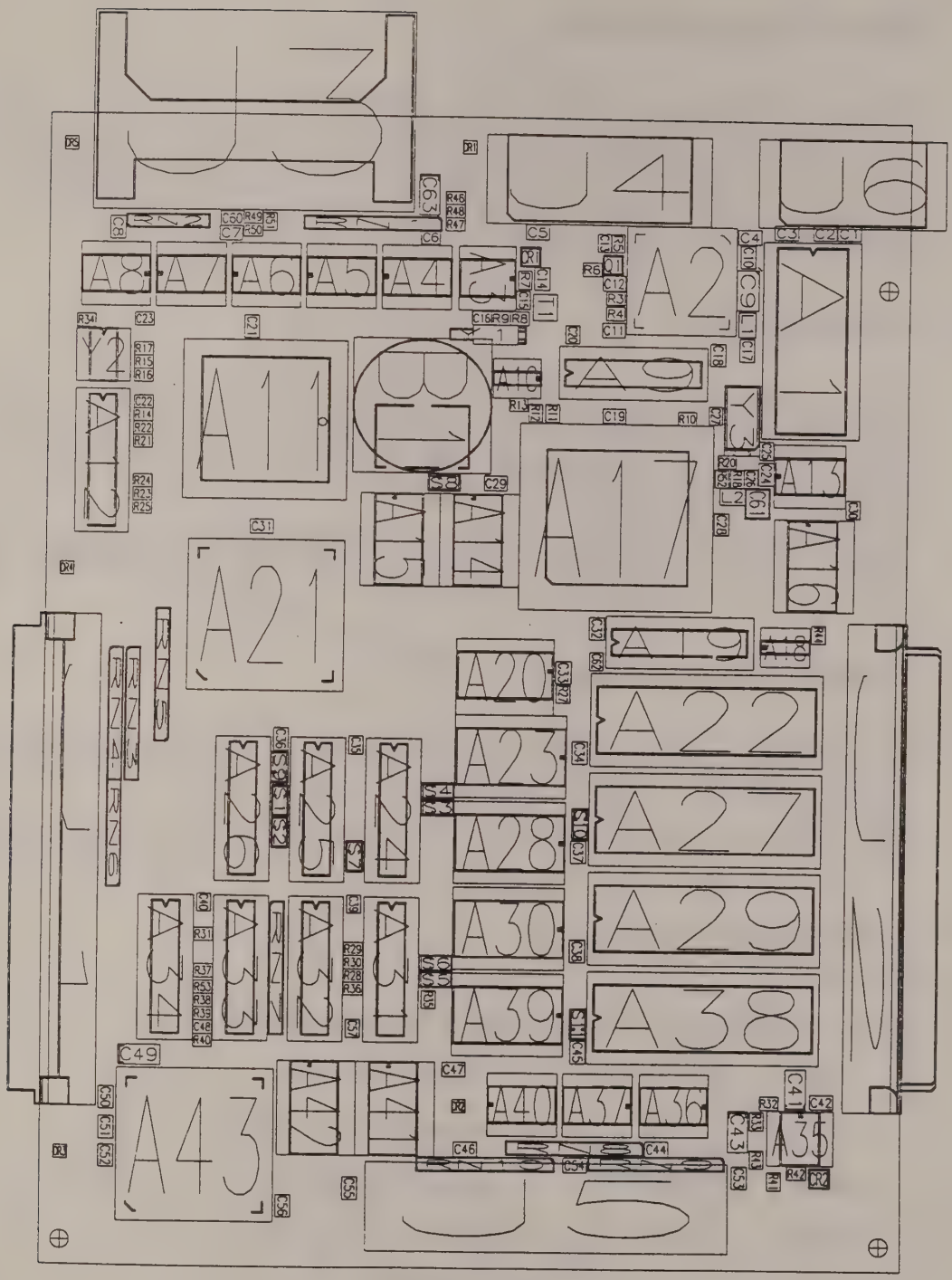
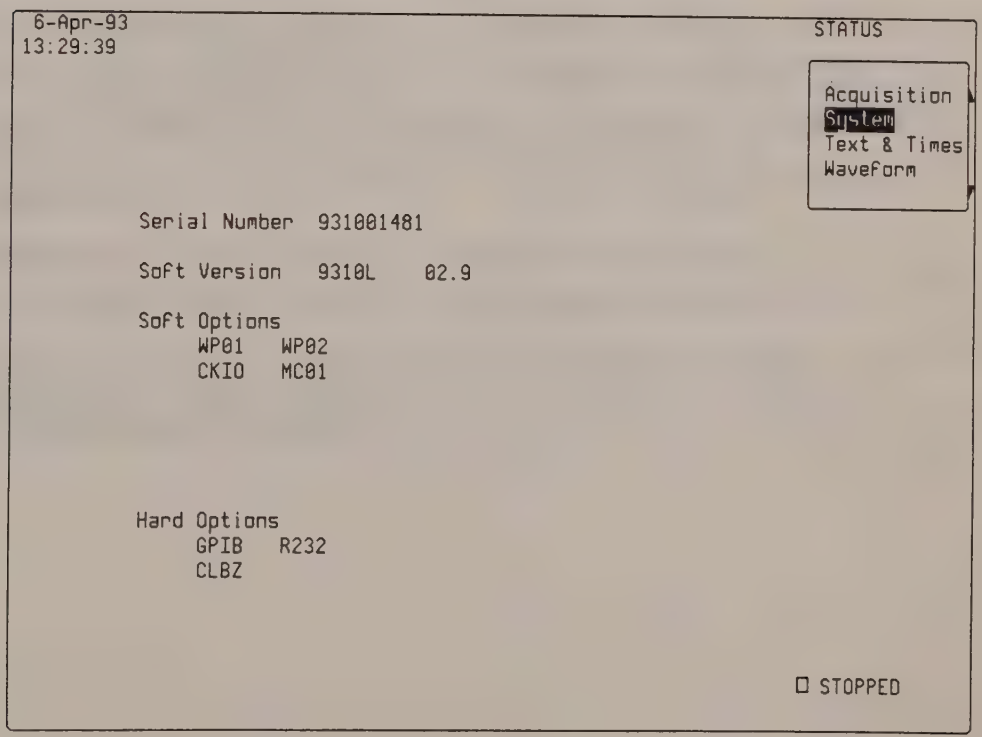

J3
J4
J6
A8
A7
A6
A5
A4
A3
A2
A1
A11
B1
A10
A9
A12
A17
A15
A13
A14
A16
A21
A19
A20
A22
A23
A27
A28
A26
A25
A24
A29
A30
A31
A32
A33
A34
A39
A38
A43
A42
A41
A40
A37
A36
A35
J5
J1
J2

Figure 7.7

Options			GAL Description
Card	WP02	WP01	
—	—	—	Standard: GAL not necessary
—	—	X	CLE 0001-A
—	X	—	CLE 0002-A
—	X	X	CLE 0003-A
X	—	—	CLE 0200-A
X	—	X	CLE 0201-A
X	X	—	CLE 0202-A
X	X	X	CLE 0203-A

GAL CLE XXXX-R, XXXX : Software option, R : Release



7.3.4 Processor Board Exchange Procedure

The replacement board is supplied without any firmware or options. Therefore the existing GAL (Loc A19) and eproms (Loc A22, A27, A29, A38) must be transfered from the faulty board to the new board. After upgrading firmware or changing the software option, check that the scope boots correctly. Then check in the system summary, by using the show status button on the front panel, the software version, software options and serial number.

The serial number of the 9310 oscilloscope is loaded in the real time clock memory which is battery backed up. If it becomes necessary to replace the processor board, the serial number must be loaded in the memory of the new board by using LeCroy program " LeCalsoft " under GPIB remote control.

To run " LeCalsoft " type SKP.exe, in the main menu type S, and follow the instructions, use five digits to enter the serial number (i.e. 01481).

7.4 Equipment and Spare Parts Recommended for Service

7.4.1 Equipment

The following equipment is needed to provide the technician access to the 9310 subassemblies during repair and calibration.

1-	Sine wave generator:	Marconi 2019A, 2022C, 2030 or equivalent.
2-	Sine wave generator:	5 volt peak to peak amplitude type SG 503 or equivalent.
3-	DC precision power supply:	Tektronix PS5004 or equivalent.
4-	Digital Multimeter:	Philips 2525 or equivalent.
5-	Digital scope 350 MHz:	LeCroy 9450A or equivalent.
6-	Fast rise time pulser:	LeCroy 4969 (<700ps), equivalent.
7-	BNC coaxial cables:	(5ns, 2ns, 1ns), adapter T BNC, adapter BNC-Jack, 50 Ohm BNC terminator feed through.

7.4.2 Spare Parts

In order to make the repair of 9310 oscilloscope at board level, a minimum stock of boards is at least one each:

- F9300-1 or F9314M-1	:	Processor board
- F9310-3 or F9310M-3 or F9310L-3	:	Main board
- F9300-4	:	GPIB/RS232 interface
- F9310-5	:	Front panel with keyboard
- 93XX-Display	:	Raster monitor kit
- 93XX-PS1715	:	Power supply

If the unit is equipped with the 93XX-FD01 and 93XX-GP01 options :

- F9300-6	:	Graphic printer, Floppy, Centronics Interface
- F9300-7	:	Graphic printer controller
- 334000832	:	LPT5446 Seiko Graphic printer
- 335023203	:	Floppy disk drive

The other parts (fan, fuse holder, scope handle, covers, rear panel...) are not on the above list because they are reliable parts and the probability of failure is very low.

7.5 Troubleshooting and Flow Charts

7.5.1 Introduction

The troubleshooting information contained in this section is intended for use by qualified personnel having a basic understanding of electronics (analog and digital). In order to simplify servicing and minimize downtime, the following list of possible symptoms, likely causes, and troubleshooting steps have been prepared.
Most procedures in this section will allow troubleshooting down to the board level.

Defective circuit boards will be repaired or exchange by the regional LeCroy service office or the local representative (see section 1.4).

The first step in troubleshooting is to check for obvious items like blown fuses. The power supply is the next item to check before proceeding to more detailed troubleshooting, since noise or low power supply voltages can cause a variety of digital and analog problems.

7.5.2 Line Voltage Autoranging

The 9310 oscilloscope operates from a 115 V (90 to 132 V) or 220 V (180 to 250 V) normal power source at 45 Hz to 66 Hz. No voltage selection is required since the instrument automatically adapts to the line voltage which is present. The instrument operates at line frequencies up to 440 Hz. However, at frequencies above 60 Hz, the leakage current from phase to ground slightly exceeds the safety recommendations for industrial instruments in some countries. This current reaches 4 mA Max at 250 V/400 Hz.

7.5.3 Line Fuses Replacement

The power supply of the oscilloscope is protected against short circuits and overload by means of two 5A/250 V fuses located above the main plugs.

W A R N I N G

Disconnect the instrument from the power line and from other equipment before replacing fuses.

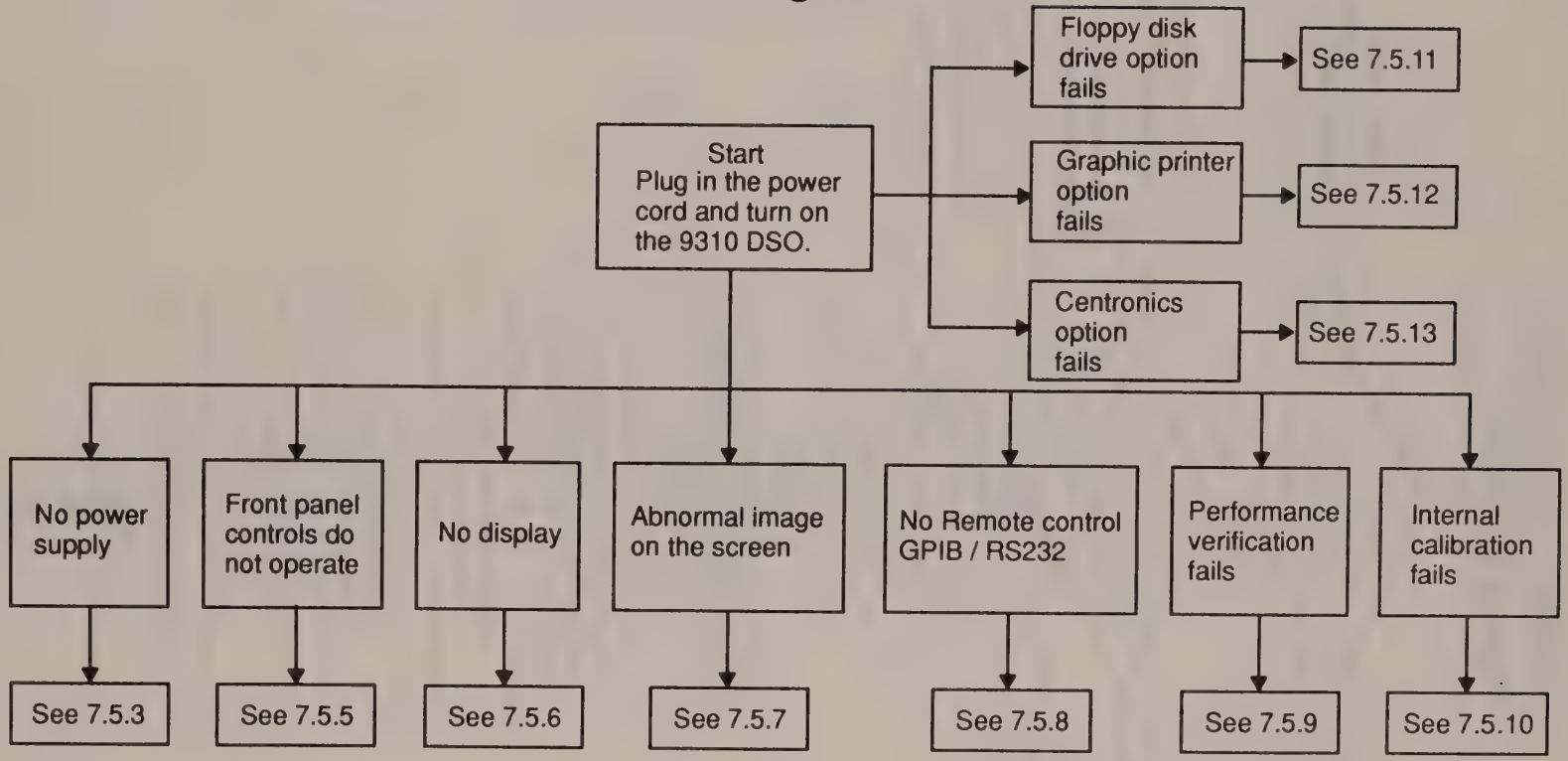
To replace line fuses, proceed as follow:

- Turn off the power and disconnect the line cord from the instrument
- Open the fuse box by inserting a small flat screwdriver under the plastic cover and remove the fuse carrier from the holder
- Remove the 5 amp fuse and replace it with the proper type:

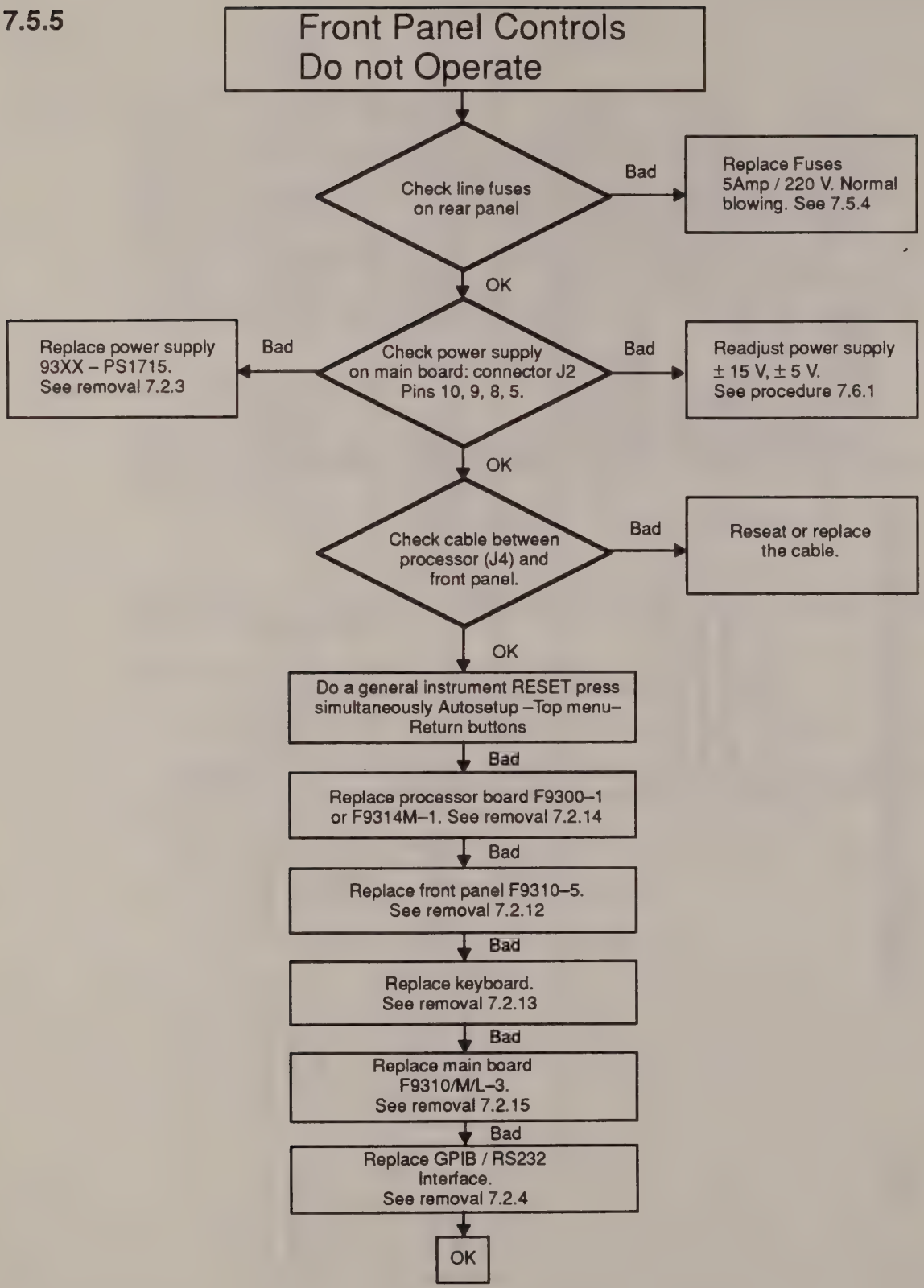
  5 amp/250 V, 3AG normal blowing.

  LeCroy part number: 433 162 500

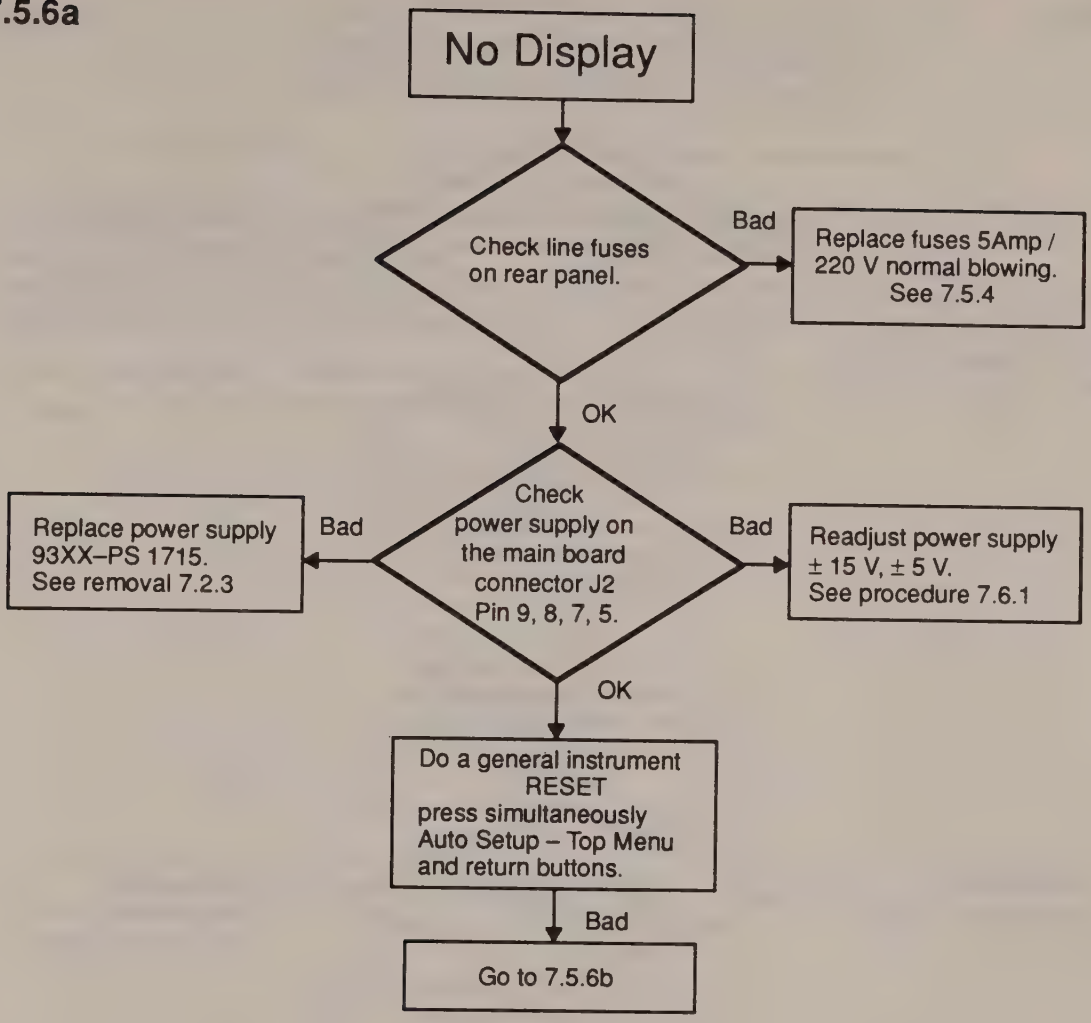
7.5.4 Initial Troubleshooting Chart



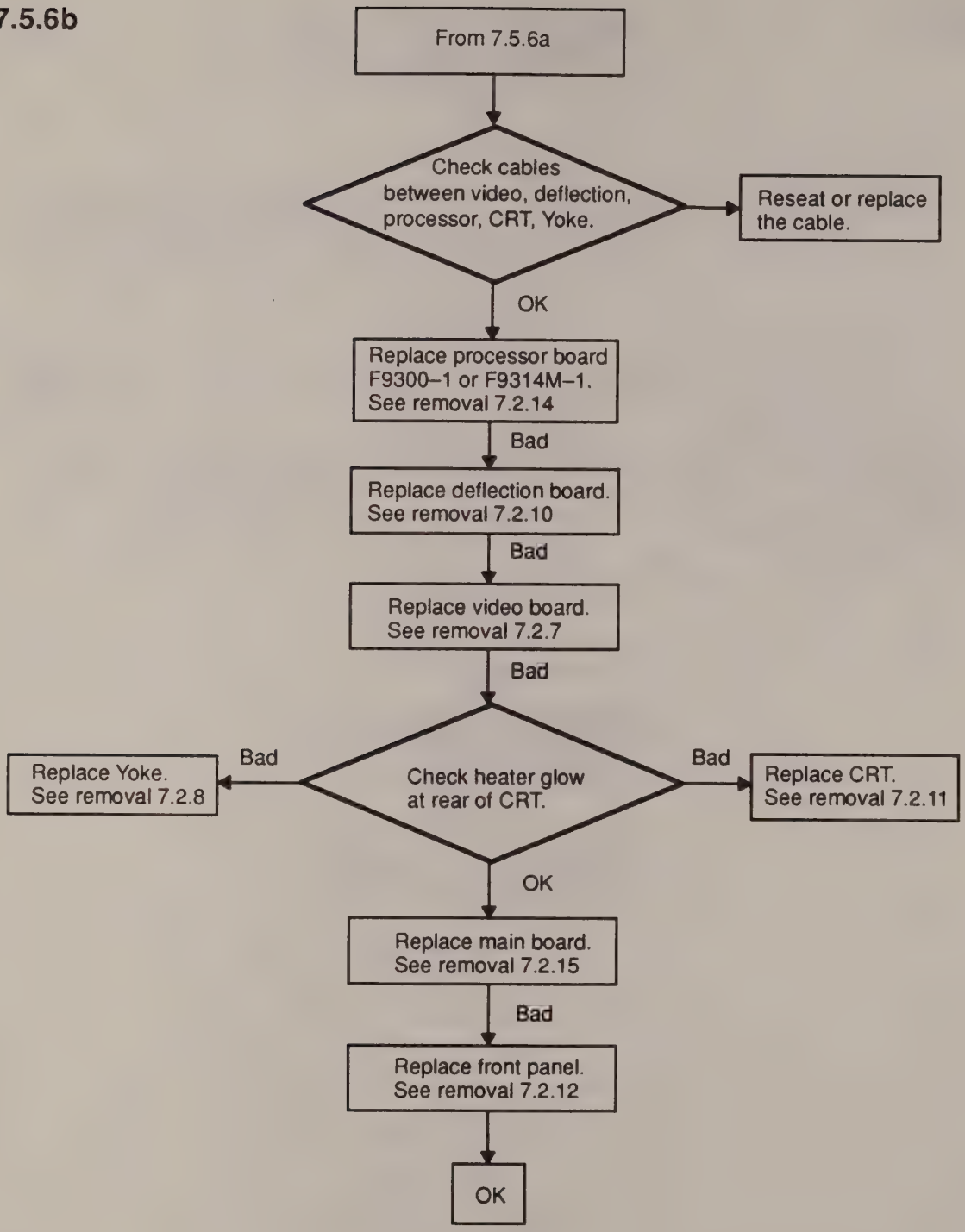
7.5.5


Front Panel Controls Do not Operate
Check line fuses on rear panel
Bad
Replace Fuses 5Amp / 220 V. Normal blowing. See 7.5.4
OK
Replace power supply 93XX – PS1715. See removal 7.2.3
Bad
Check power supply on main board: connector J2 Pins 10, 9, 8, 5.
Bad
Readjust power supply ± 15 V, ± 5 V. See procedure 7.6.1
OK
Check cable between processor (J4) and front panel.
Bad
Reseat or replace the cable.
OK
Do a general instrument RESET press simultaneously Autosetup –Top menu– Return buttons
Bad
Replace processor board F9300–1 or F9314M–1. See removal 7.2.14
Bad
Replace front panel F9310–5. See removal 7.2.12
Bad
Replace keyboard. See removal 7.2.13
Bad
Replace main board F9310/M/L–3. See removal 7.2.15
Bad
Replace GPIB / RS232 Interface. See removal 7.2.4
OK

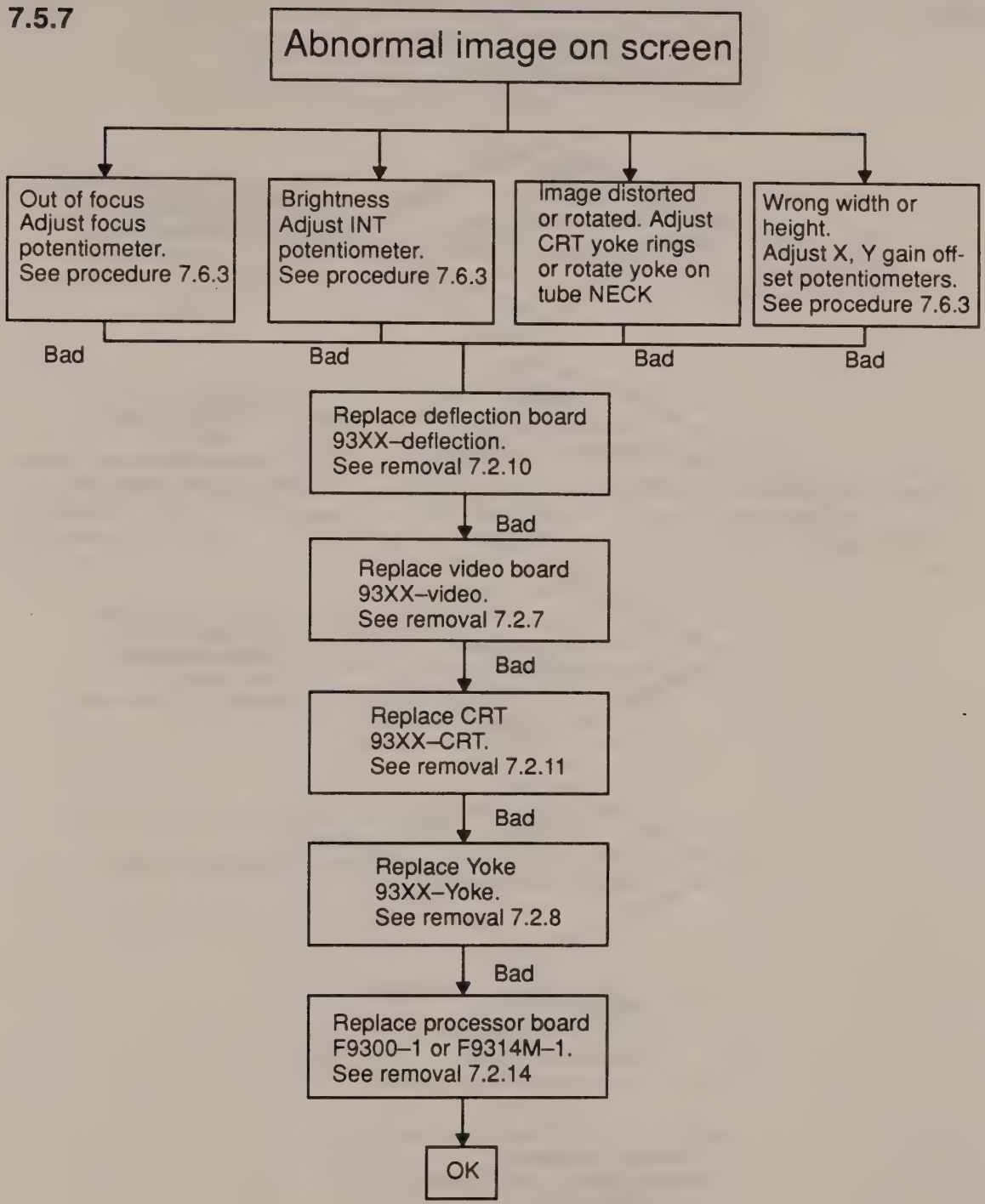
7.5.6a


No Display
Check line fuses on rear panel.
Bad
Replace fuses 5Amp / 220 V normal blowing. See 7.5.4
OK
Check power supply on the main board connector J2 Pin 9, 8, 7, 5.
Bad
Replace power supply 93XX–PS 1715. See removal 7.2.3
Bad
Readjust power supply ± 15 V, ± 5 V. See procedure 7.6.1
OK
Do a general instrument RESET press simultaneously Auto Setup – Top Menu and return buttons.
Bad
Go to 7.5.6b

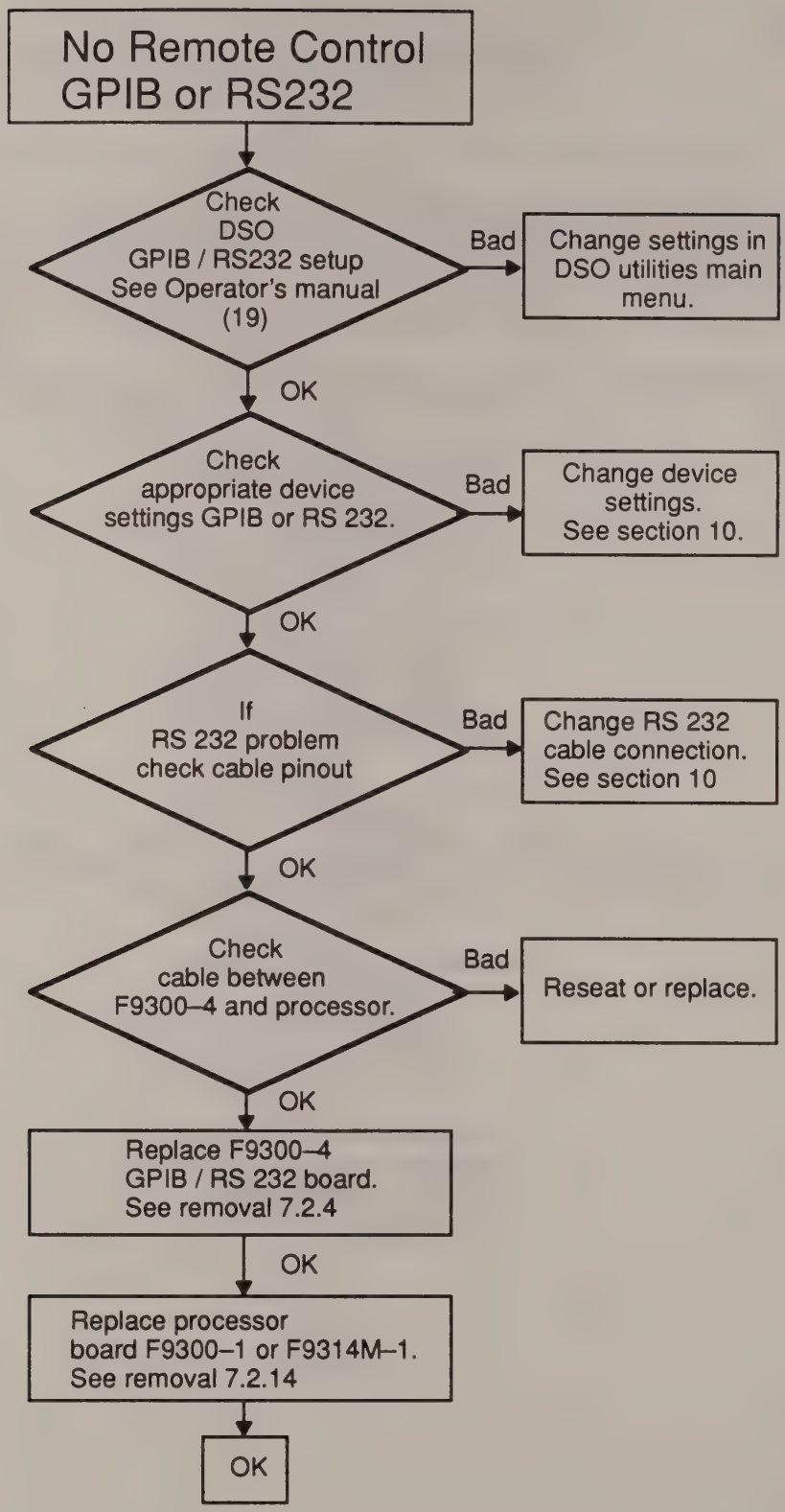
7.5.6b


From 7.5.6a
Check cables between video, deflection, processor, CRT, Yoke.
Reseat or replace the cable.
OK
Replace processor board F9300–1 or F9314M–1. See removal 7.2.14
Bad
Replace deflection board. See removal 7.2.10
Bad
Replace video board. See removal 7.2.7
Bad
Check heater glow at rear of CRT.
Bad
Replace Yoke. See removal 7.2.8
Bad
Replace CRT. See removal 7.2.11
OK
Replace main board. See removal 7.2.15
Bad
Replace front panel. See removal 7.2.12
OK

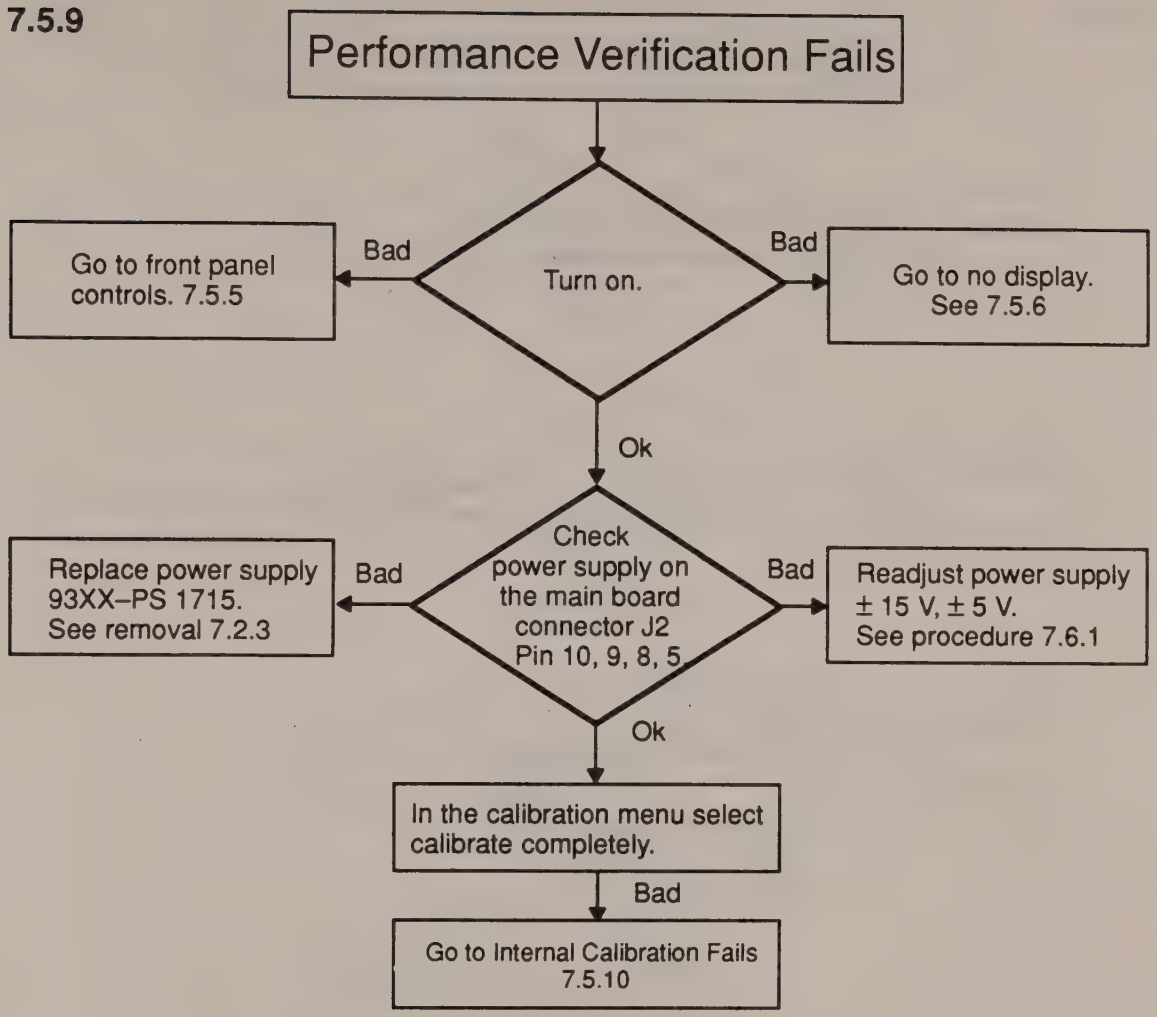
7.5.7


Abnormal image on screen
Out of focus
Adjust focus potentiometer.
See procedure 7.6.3
Brightness
Adjust INT potentiometer.
See procedure 7.6.3
Image distorted or rotated. Adjust CRT yoke rings or rotate yoke on tube NECK
Wrong width or height.
Adjust X, Y gain offset potentiometers.
See procedure 7.6.3
Bad
Bad
Bad
Bad
Replace deflection board 93XX–deflection.
See removal 7.2.10
Bad
Replace video board 93XX–video.
See removal 7.2.7
Bad
Replace CRT 93XX–CRT.
See removal 7.2.11
Bad
Replace Yoke 93XX–Yoke.
See removal 7.2.8
Bad
Replace processor board F9300–1 or F9314M–1.
See removal 7.2.14
OK

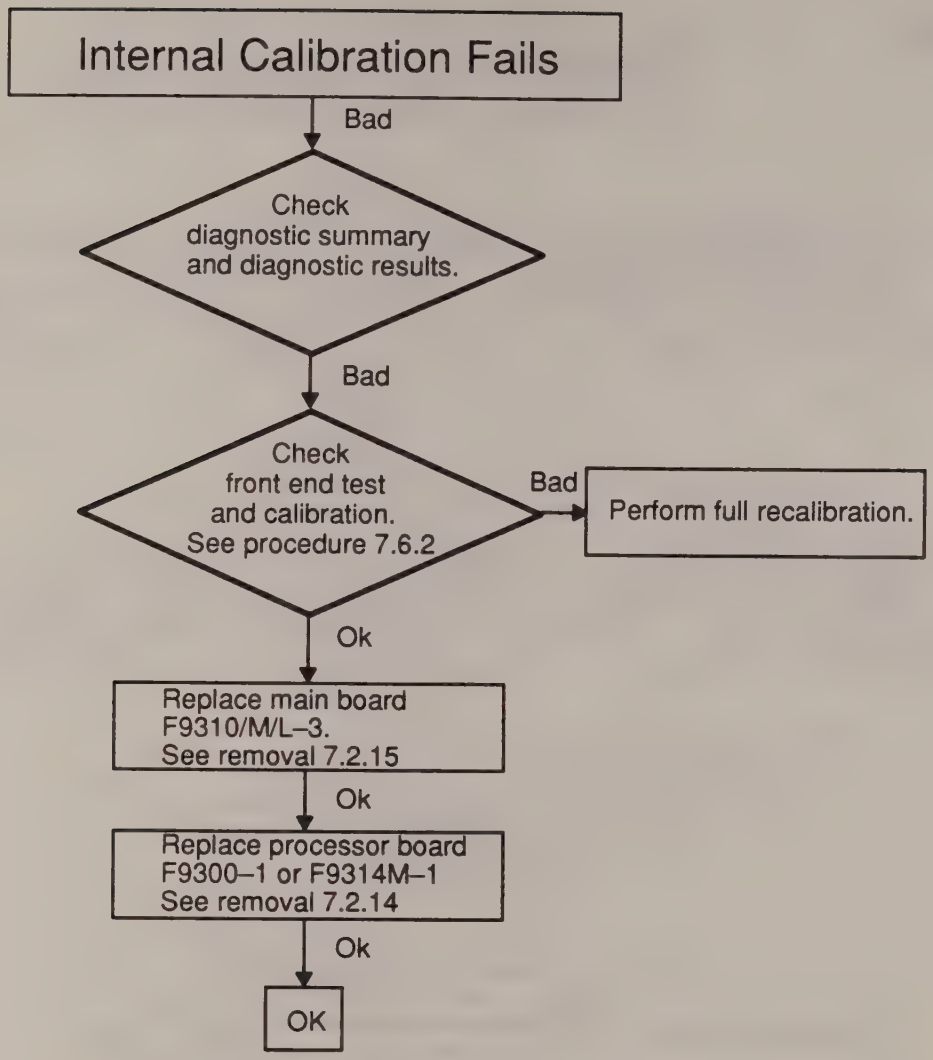
7.5.8


No Remote Control
GPIB or RS232
Check
DSO
GPIB / RS232 setup
See Operator's manual
(19)
Bad
Change settings in
DSO utilities main
menu.
OK
Check
appropriate device
settings GPIB or RS 232.
Bad
Change device
settings.
See section 10.
OK
If
RS 232 problem
check cable pinout
Bad
Change RS 232
cable connection.
See section 10
OK
Check
cable between
F9300–4 and processor.
Bad
Reseat or replace.
OK
Replace F9300–4
GPIB / RS 232 board.
See removal 7.2.4
OK
Replace processor
board F9300–1 or F9314M–1.
See removal 7.2.14
OK

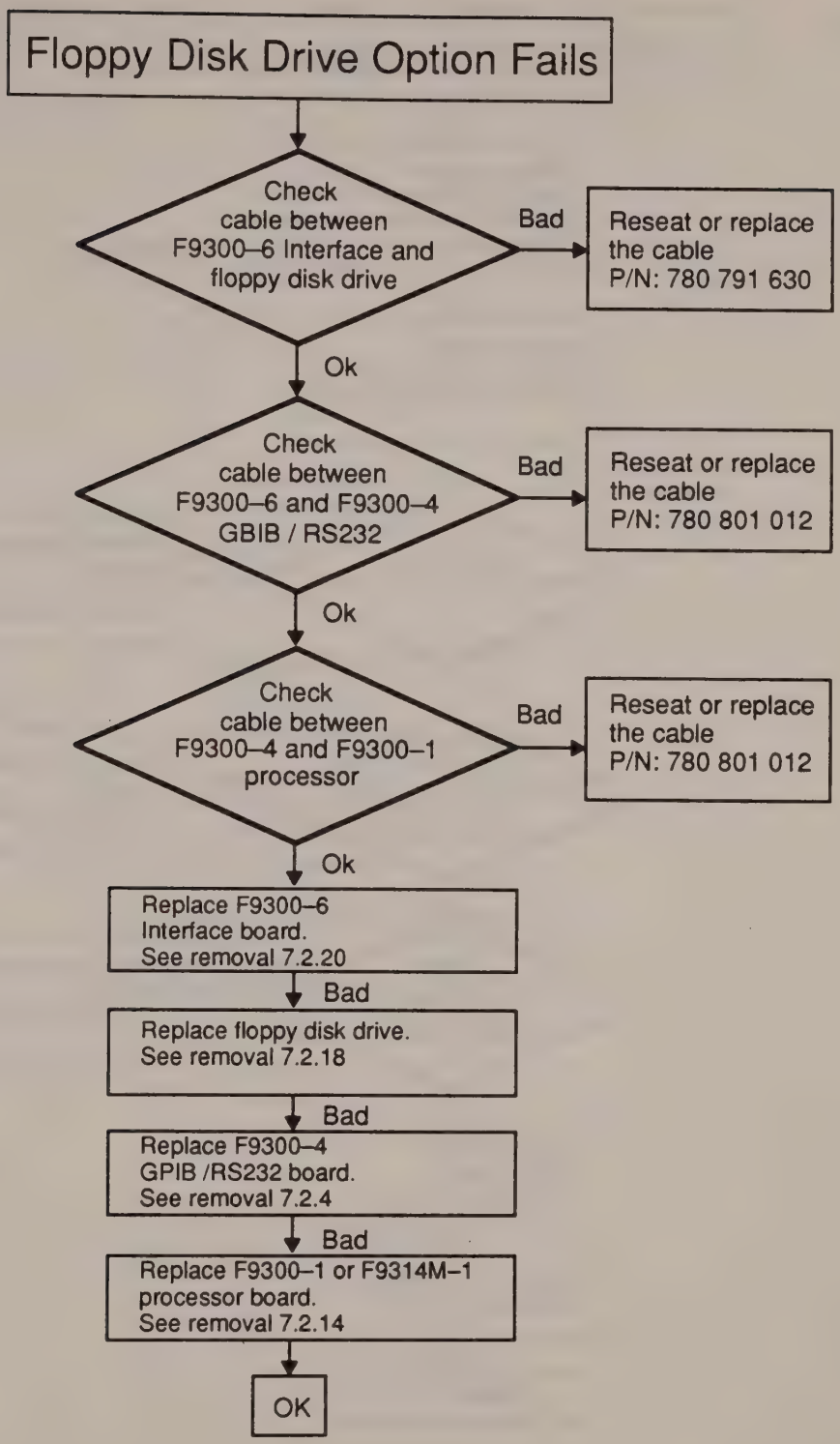
7.5.9


Performance Verification Fails
Turn on.
Bad
Go to front panel controls. 7.5.5
Bad
Go to no display. See 7.5.6
Ok
Check power supply on the main board connector J2 Pin 10, 9, 8, 5
Bad
Replace power supply 93XX–PS 1715. See removal 7.2.3
Bad
Readjust power supply ± 15 V, ± 5 V. See procedure 7.6.1
Ok
In the calibration menu select calibrate completely.
Bad
Go to Internal Calibration Fails 7.5.10

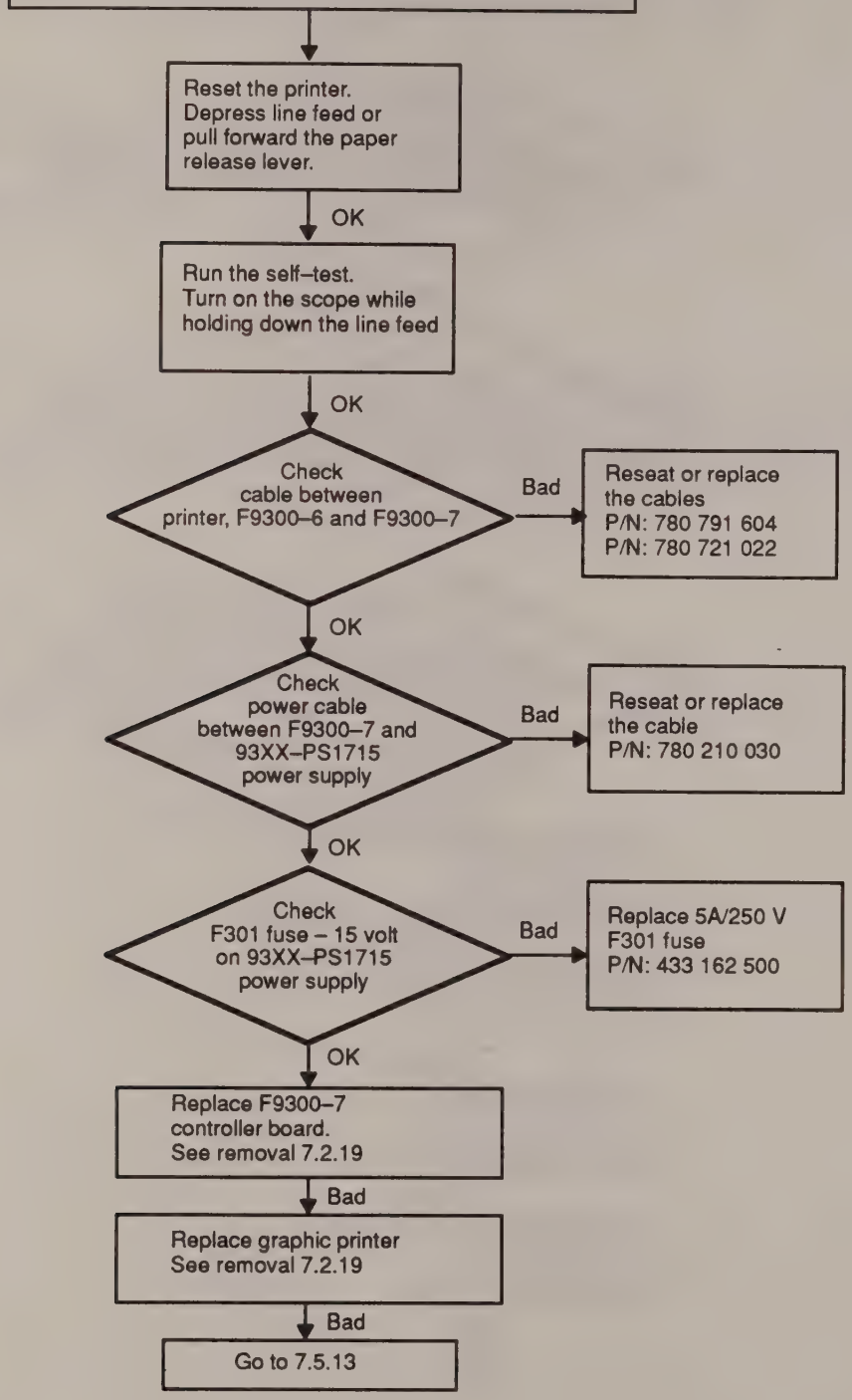
7.5.10


Internal Calibration Fails
Bad
Check diagnostic summary and diagnostic results.
Bad
Check front end test and calibration. See procedure 7.6.2
Bad
Perform full recalibration.
Ok
Replace main board F9310/M/L–3. See removal 7.2.15
Ok
Replace processor board F9300–1 or F9314M–1 See removal 7.2.14
Ok
OK

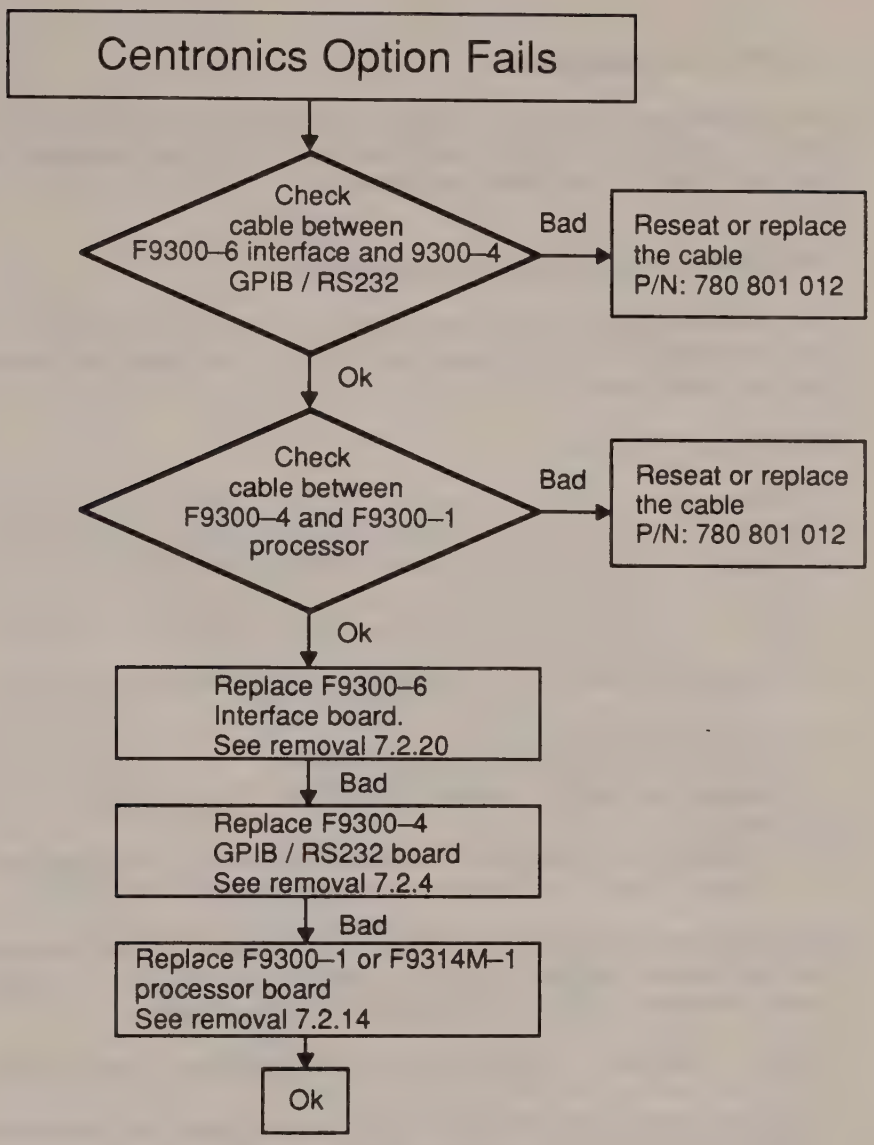
7.5.11


Floppy Disk Drive Option Fails
Check cable between F9300–6 Interface and floppy disk drive
Bad
Reseat or replace the cable P/N: 780 791 630
Ok
Check cable between F9300–6 and F9300–4 GBIB / RS232
Bad
Reseat or replace the cable P/N: 780 801 012
Ok
Check cable between F9300–4 and F9300–1 processor
Bad
Reseat or replace the cable P/N: 780 801 012
Ok
Replace F9300–6 Interface board. See removal 7.2.20
Bad
Replace floppy disk drive. See removal 7.2.18
Bad
Replace F9300–4 GPIB /RS232 board. See removal 7.2.4
Bad
Replace F9300–1 or F9314M–1 processor board. See removal 7.2.14
OK

Graphic Printer Option Fails



7.5.13


Centronics Option Fails
Check cable between F9300–6 interface and 9300–4 GPIB / RS232
Bad
Reseat or replace the cable P/N: 780 801 012
Ok
Check cable between F9300–4 and F9300–1 processor
Bad
Reseat or replace the cable P/N: 780 801 012
Ok
Replace F9300–6 Interface board. See removal 7.2.20
Bad
Replace F9300–4 GPIB / RS232 board See removal 7.2.4
Bad
Replace F9300–1 or F9314M–1 processor board See removal 7.2.14
Ok

7.6 Calibration Procedures

The following section includes the adjustments required for the power supply, front end and display. It is recommended that they be verified at one year intervals.

7.6.1 93XX-PS1715 Power Supply Calibration

The four voltages are adjustable by ± 5% of the nominal value. The reference for the measurements are the pins on connector J2 located on the main board.

From right to left:

Pin 10:	-15.1 V	(Min = -14.85 V, Max = -15.15 V)
Pin 9:	+15.1 V	(Min = +14.85 V, Max = +15.15 V)
Pin 8:	- 5.2 V	(Min = - 5.15 V, Max = - 5.25 V)
Pin 6:	GND	
Pin 5:	+ 5.2 V	(Min = + 5.15 V, Max = - 5.25 V)

For the calibration of the power supply proceed as follow:

- Turn off the power
- Remove the top cover (7.2.2)
- Remove the front frame assembly (7.2.9) and put it to the right of the unit.
- By using two extension cables, reconnect the processor board to the front panel (J4) and to the deflection board (J6).

The front frame assembly is now reconnected to the processor through the extension cables. The four potentiometers are accessible from the front through holes in the power supply chassis.

Turn on the power and perform the adjustments (see figure 7.8).

Turn the potentiometer clockwise to increase the tension or counterclockwise to decrease the voltage.

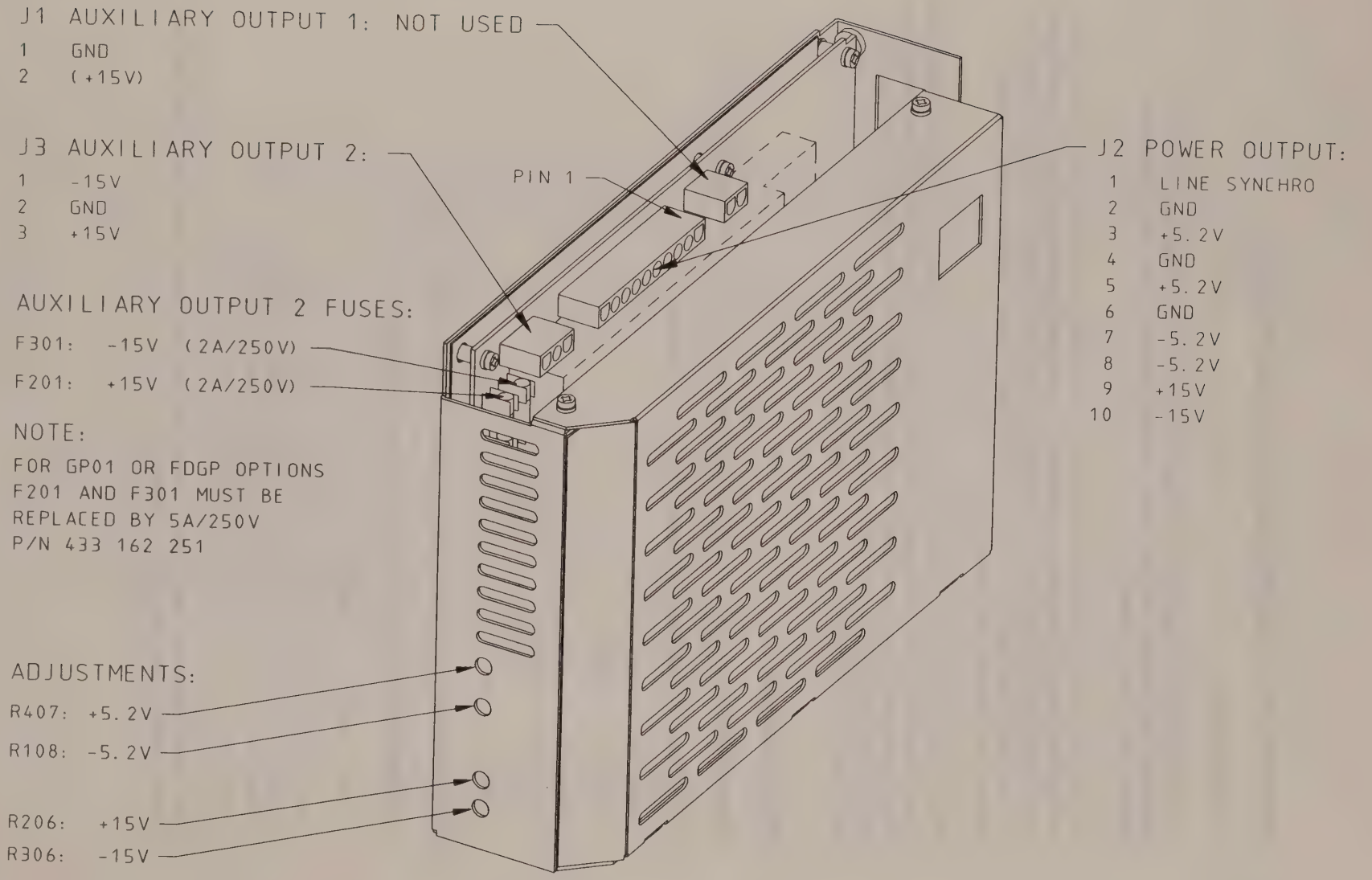


FIGURE 7.8: 93XX-PS1715 POWER SUPPLY

7.6.2 F9310/M/L Front End Test and Calibration Procedure

7.6.2.1 Introduction

The adjustments describe in the following calibration procedure require extension of the front panel assembly out of the scope, using two flat cables.

In order to access the front end potentiometers (overload, gain) and variable caps (flatness, overshoot) located underneath the Cathode Ray tube and deflection board, dismount the front panel assembly from the scope and reconnect it to the processor board connectors J4 and J6, using the extension cable set.

Once the top cover is removed and the front panel is disassembled from the scope, extra cooling of the main board is required. It's mandatory to disconnect the existing Fan from connector J3, located on F9310-3 card, and to use a Fan with the air flow oriented to the front end section of the board.

7.6.2.2 Power Supplies

Remove the front end cover shield to access the Test point TP101.

Check the following voltages with a voltmeter :

```
Pin  1 :  GND
Pin  2 :  GND

Pin  7 :  - 12 V   +/-  0.50 V
Pin  8 :  + 12 V   +/-  0.50 V
Pin  9 :  -  8 V   +/-  0.35 V
Pin 10 :  +  8 V   +/-  0.35 V
```

For connector and test points, see figure 7.10.

On connector J2 check the following voltages :

```
Pin  2,4,6 :     GND

Pin  3,5   :  +  5.1 V :  5.15 V < VCC < 5.25 V
Pin  7,8   :  -  5.1 V :  5.15 V < VEE < 5.25 V
Pin  9     :  + 15.1 V : 14.85 V <  V  < 15.15 V
Pin  10    :  - 15.1 V : 14.85 V <  V  < 15.15 V
```

The four tensions mentioned above are adjustable, see the 93XX-PS1715 power supply calibration procedure.

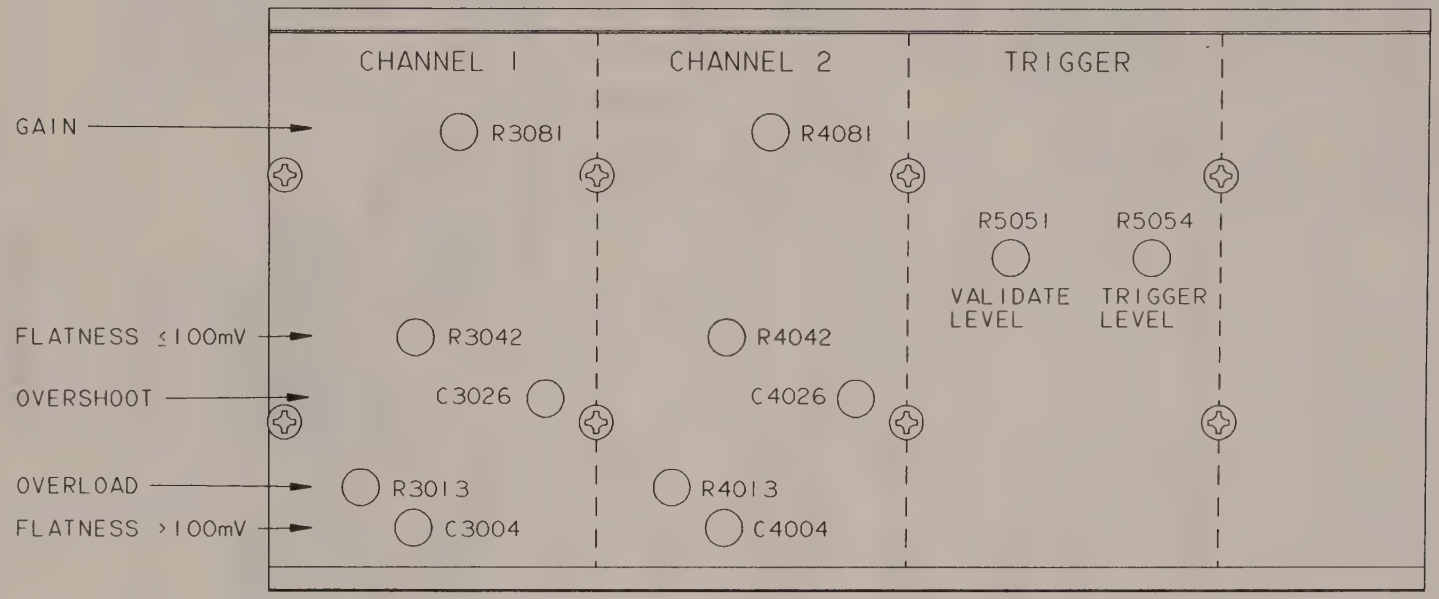


FIGURE 7.9: 9310 FRONT END ADJUSTMENT

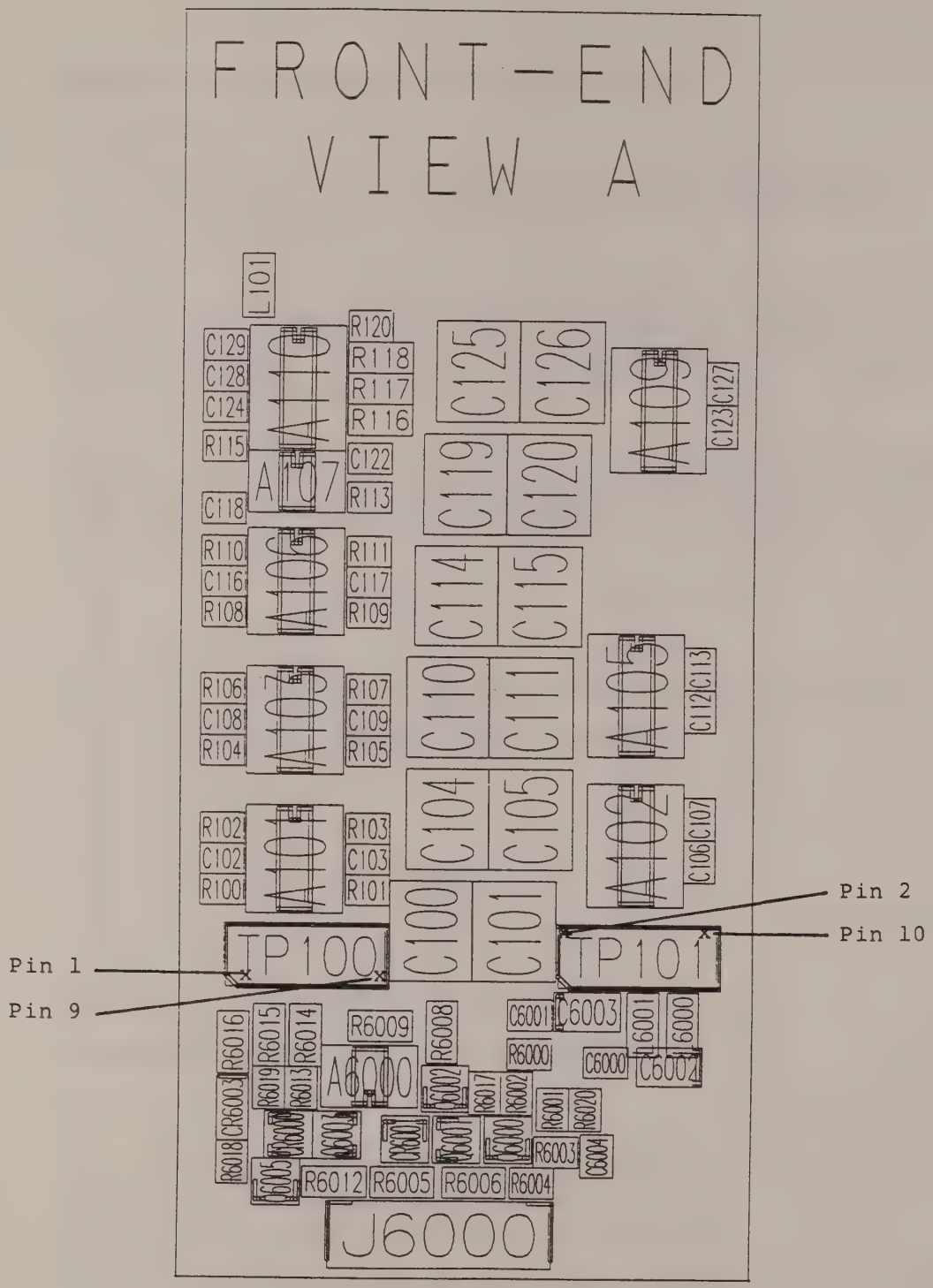
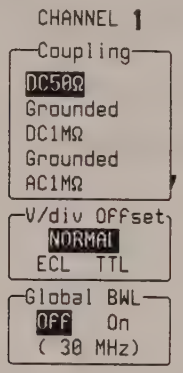

FRONT-END
VIEW A
L101
R120
C129
C128
C124
R118
R117
R116
C125
C126
A110
A109
C123
C127
R115
A107
C122
R113
C118
C119
C120
R110
C116
R108
A106
R111
C117
R109
C114
C115
R106
C108
R104
A103
R107
C109
R105
C110
C111
A105
C112
C113
R102
C102
R100
A104
R103
C103
R101
C104
C105
A102
C106
C107
C100
C101
TP100
TP101
Pin 1
Pin 9
Pin 2
Pin 10
R6016
R6015
R6014
R6009
R6008
C6001
C6003
6001
6000
R6019
R6013
A6000
R6000
C6000
C6002
R6018
CR6003
R6017
R6002
R6001
R6020
R6003
C6004
R6012
R6005
R6006
R6004
J6000

Figure 7.10

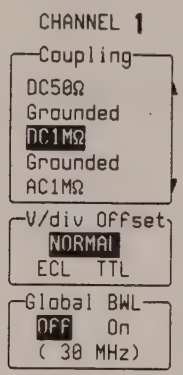
7.6.2.3 Input Impedance

7.6.2.3.1 Channel 1, 50 Ohm.



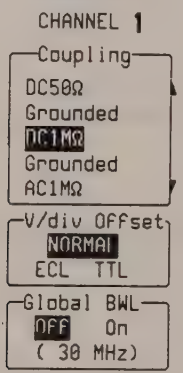
- Set DSO Channel 1 input to 50 Ohm, DC coupling, with any Time base and Gain.
- Check with a high precision DMM :
- input impedance must be 50 Ohm +/- 1%

7.6.2.3.2 Channel 1, 1 MOhm, DC, gain < 200 mV/div



- Set DSO Ch1 input to 1 MOhm, DC coupling, 100mV/div, with any Time Base.
- Check with an ohmmeter :
- input impedance must be 1 MOhm +/- 1%

7.6.2.3.3 Channel 1, 1 MOhm, DC, gain > 100 mV/div

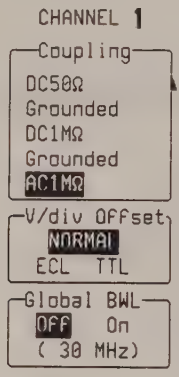


A 1/20 attenuator is used in the front end, when the Gain is greater than 100mV/div.

Repeat 1 MOhm test for 200mV/div

- input impedance must be 1 MOhm +/- 1%

7.6.2.3.4 Channel 1, 1 MOhm, AC, gain < 200 mV/div

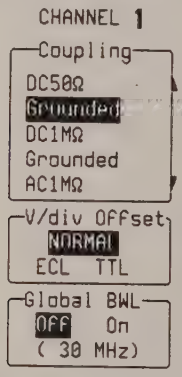


- Set DSO Ch1 input to 1 MOhm, AC coupling, 50mV/div
- input impedance must be 1.01 MOhm +/- 1% or 1 MOhm DC + 10 KOhm.

7.6.2.3.5 Channel 2, Input Impedance

- Repeat all impedance checks for Channel 2.

7.6.2.3.6 Channel 1, 1 MOhm Protective resistor



- Set scope CH1 input to DC 50 Ohm Grounded, with any Time Base and Gain.
- input impedance must be 1 MOhm +/- 2%
- If the impedance is not 1 MOhm, check the SM resistor R1006 or the relay RL1000.

7.6.2.3.7 Channel 2, 1 MOhm Protective resistor

- Set Ch2 input to DC 50 Ohm Grounded, with any Time Base and Gain.
- input impedance must be 1 MOhm +/- 2%.

In case of problem check the SM resistor R2006, or relay RL2000.

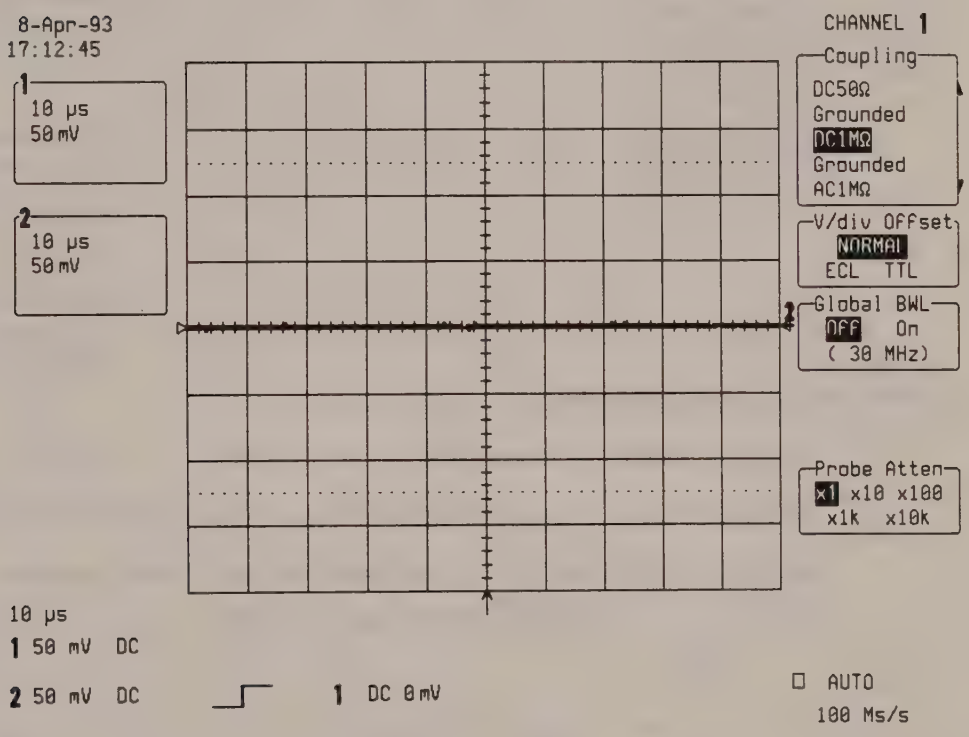
7.6.2.3.8 External Trigger Input Impedance

- Check External and External/10
- input impedance must be 1 MOhm +/-1%

7.6.2.4 Leakage Current

With a high precision DMM, type PM2525 or equivalent (> 10 Mohm) measure the leakage currents in 1 MOhm, DC on Channel 1, Channel 2.

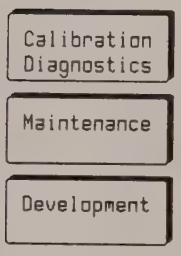
- Set DSO to 1 MOhm, DC, with gain < 200 mV/div
- Connect the DMM in DC mode to the input.
- Reading should not be larger than +/- 200 uV.



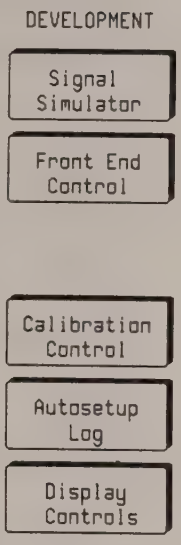
7.6.2.5. 16 bit DAC Calibration

The 9310 Calibration Diagnostics is entered by simultaneously depressing the third and fourth push buttons, and then by depressing the fifth.

- Select Development menu

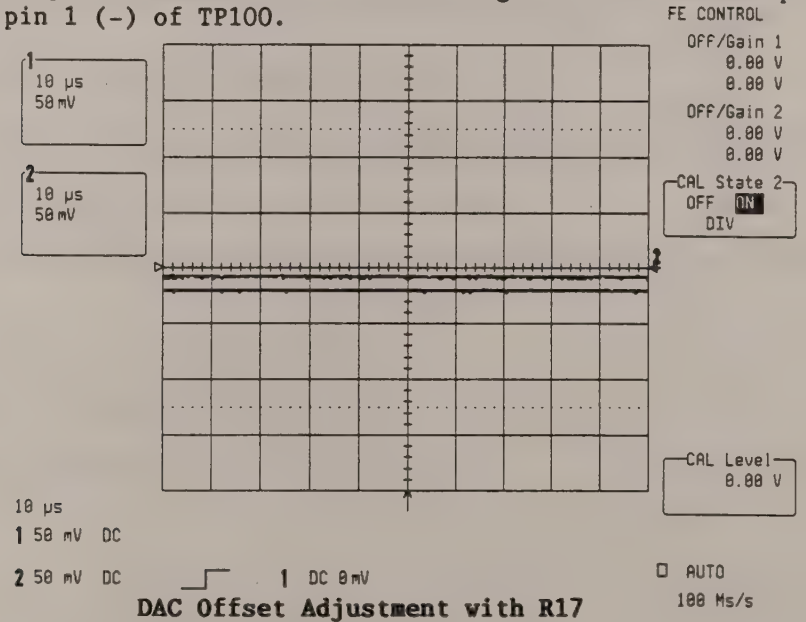


- Select Front End Control menu



7.6.2.5.1 DAC Offset Adjustment

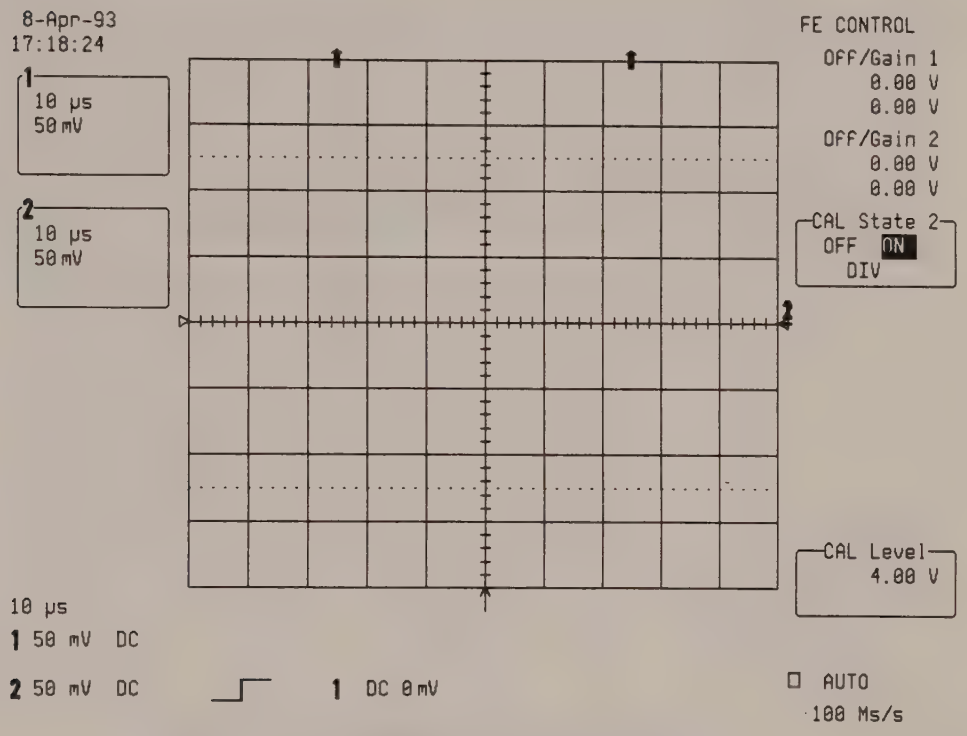
- Set Cal State = ON and Cal Level = 0.00 V
- Set DSO Channel 1 and Channel 2 to 1 MOhm, DC, 50 mV/div
- Adjust potentiometer R17 in order to get 0.00mv between pin 9 (+) and pin 1 (-) of TP100.



DAC Offset Adjustment with R17

7.6.2.5.2 DAC Gain Adjustment

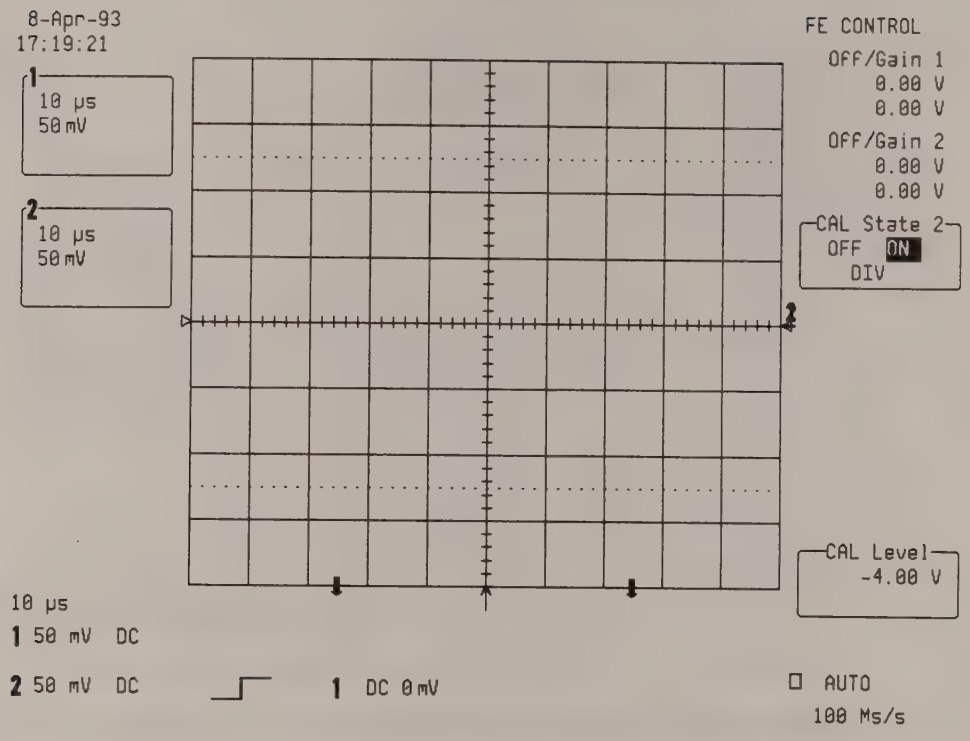
- Set Cal Level = + 4.00 V
- Adjust potentiometer R16 to get + 1.00 V +/- 1% between pin 9 (+) and pin 1 (-) of TP100.



DAC Gain Adjustment with R16

- Set Cal level = - 4.00 V

- check on TP100 pin 9 = - 1.00 V +/- 1%

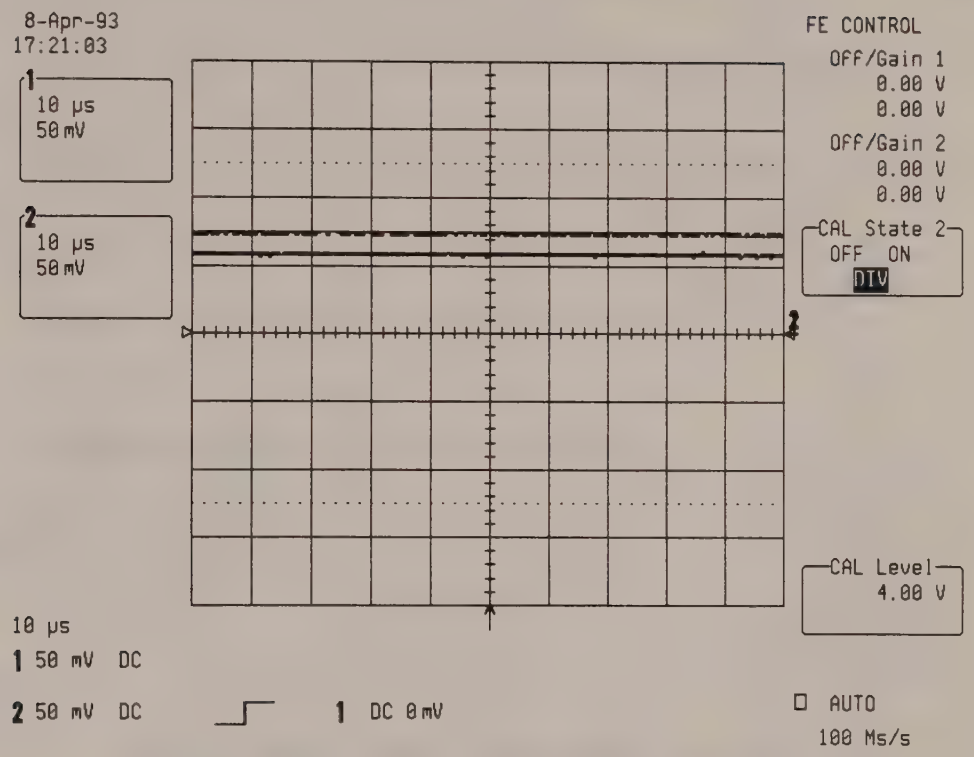


DAC Gain = - 4.00 V

- Set Cal State = Div

- Set Cal Level = + 4.00 V

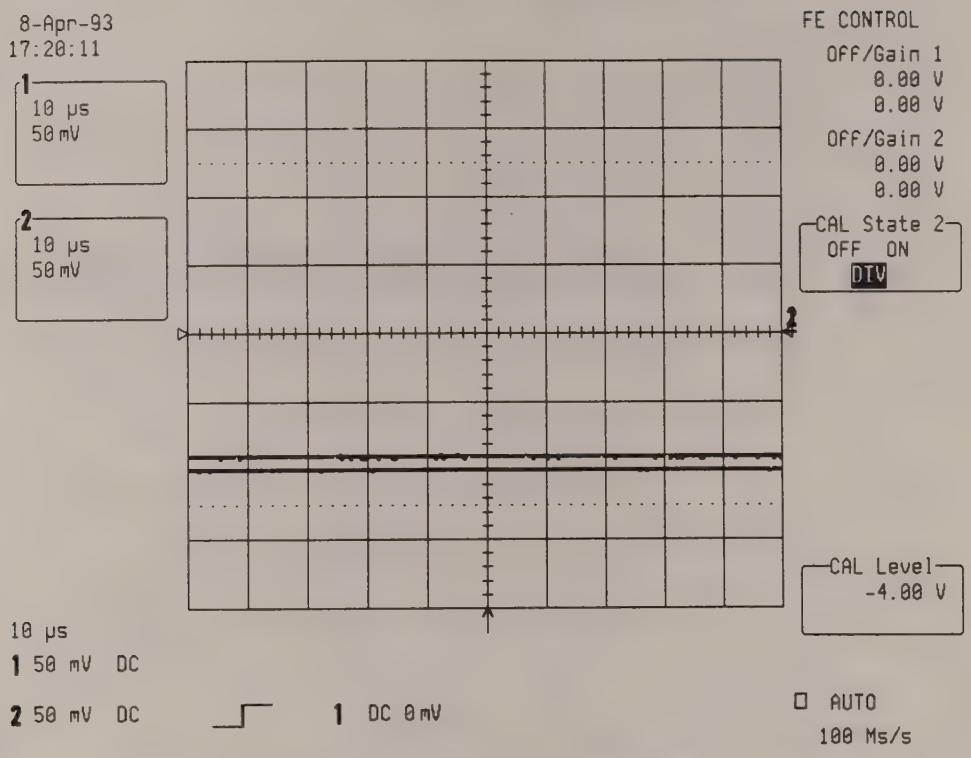
- Check on TP100 pin 9 = + 100 mV +/- 1%



DAC Gain = + 4.00 V, pin 9 = +100 mV

- Set Cal Level = - 4.00 V

- Check on TP100 Pin 9 = - 100 mV +/- 1%

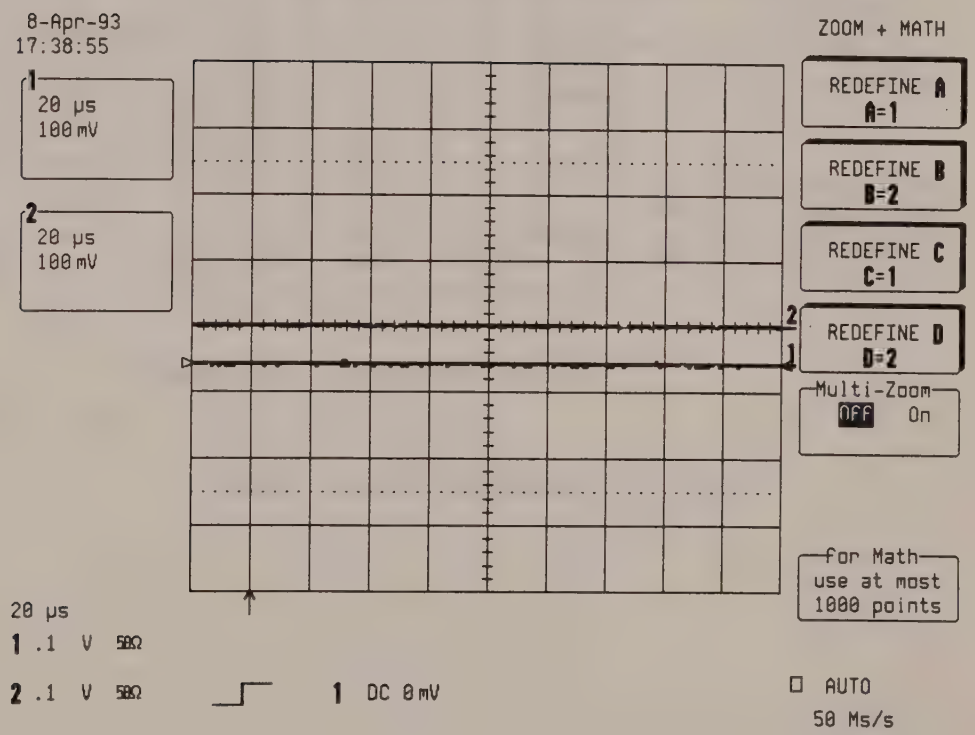


DAC Gain = - 4.00V, pin 9 = -100mv

7.6.2.6 Channel 1 HF Compensation

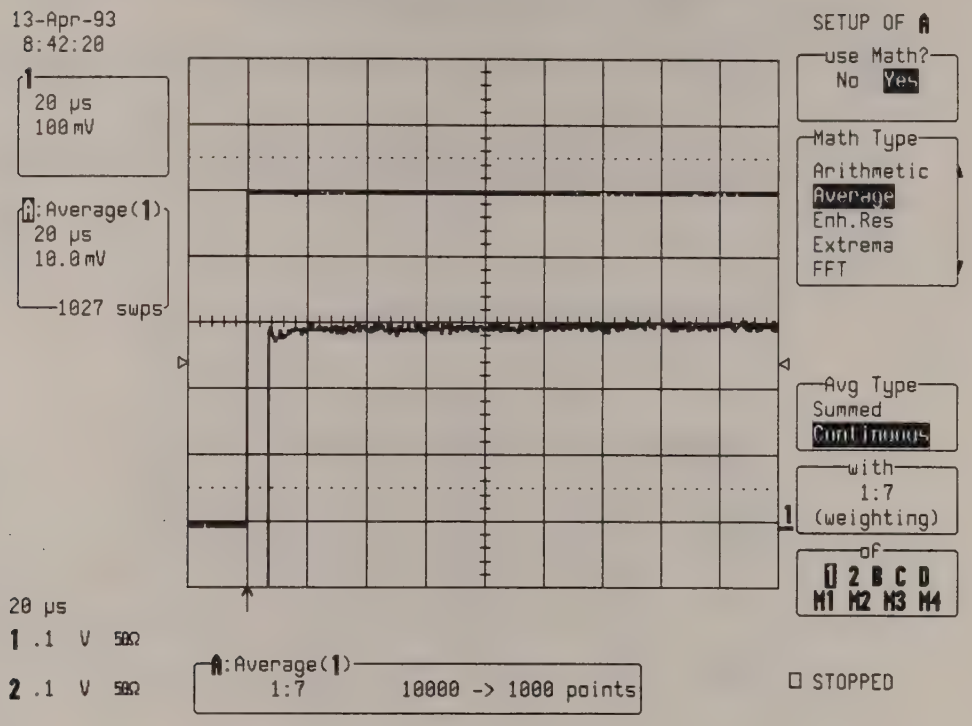
7.6.2.6.1 Channel 1 Input Buffer Flatness Adjustment

- Apply the fast risetime generator LeCroy 4969 (< 700 ps) to Ch1. Set pulser to low frequency (62.5 Ms).
- Set DSO to 50 Ohm, DC, 100mv/div, 20 us/div, Trigger on Ch1, Pos slope.
- Select Math Setup, Redefine A, Average type Summed or Continuous weight 1:7.



- With the vertical Zoom set A to 10 mV

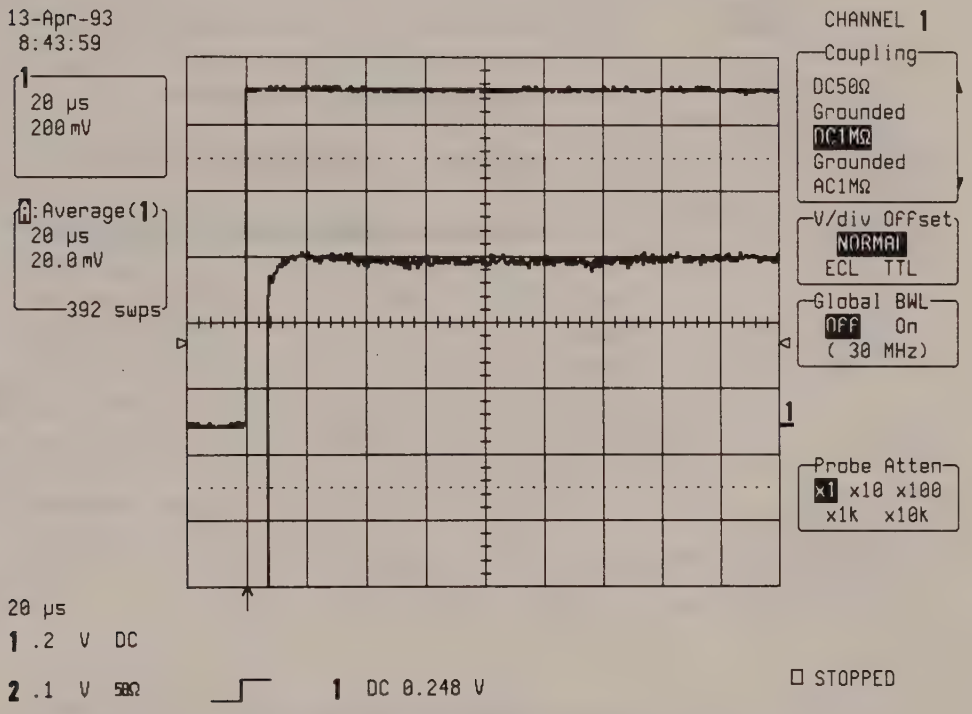
- Adjust Pot R3042 to get a flat square wave, with the top of the overshoot at the same level as the settled value.



Flatness Adjustment with R3042

7.6.2.6.2 Channel 1 1/20 Attenuator Flatness Adjustment

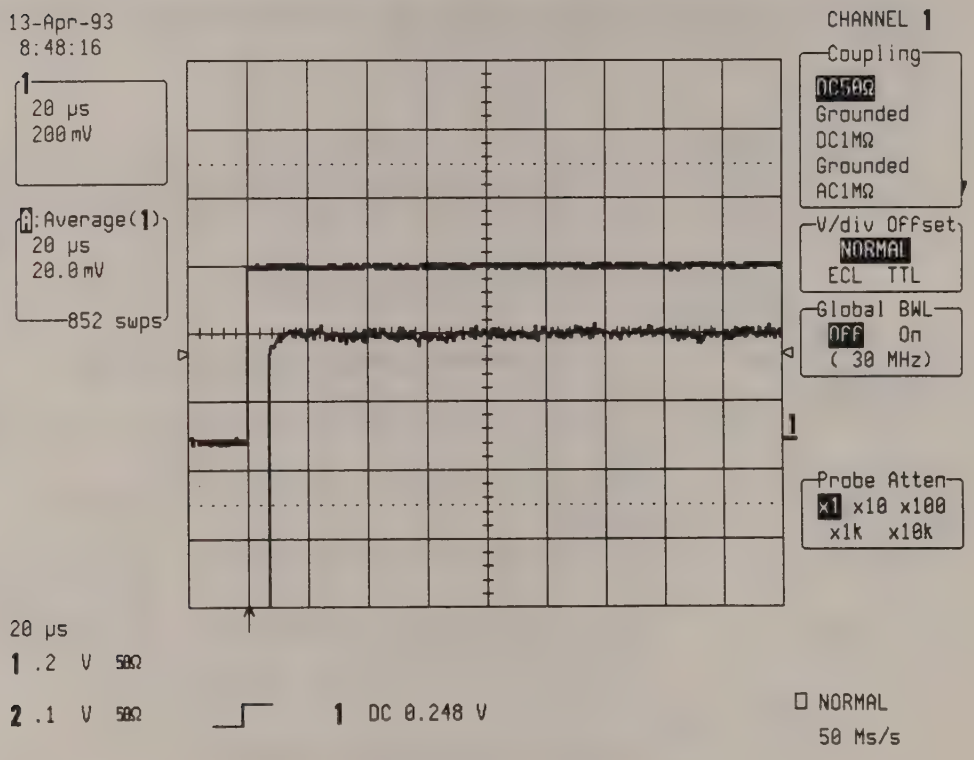
- Set DSO to 1 MOhm, DC, 200 mV/div, 20 us/div, Trigger Ch1, Pos slope.
- Use Average mode type Summed or Continuous weight 1:7.
- Adjust the variable cap C3004 to get a slight negative slope, typically 1% or 1/2 division.



1 MOhm Flatness Adjustment with C3004

- Set DSO to 50 Ohm, DC, 200 mV/div,
- Check the flatness, typically a slight positive or negative slope :

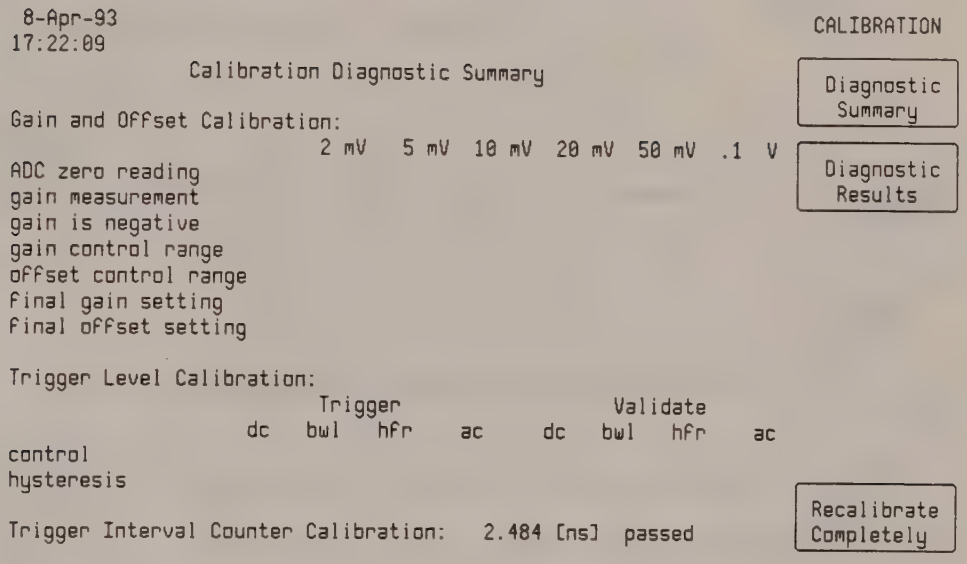
  +/- 1% or +/- 1/2 Division



50 Ohm Flatness Verification

7.6.2.6.3 Channel 1 Input Buffer DC Gain Adjustment

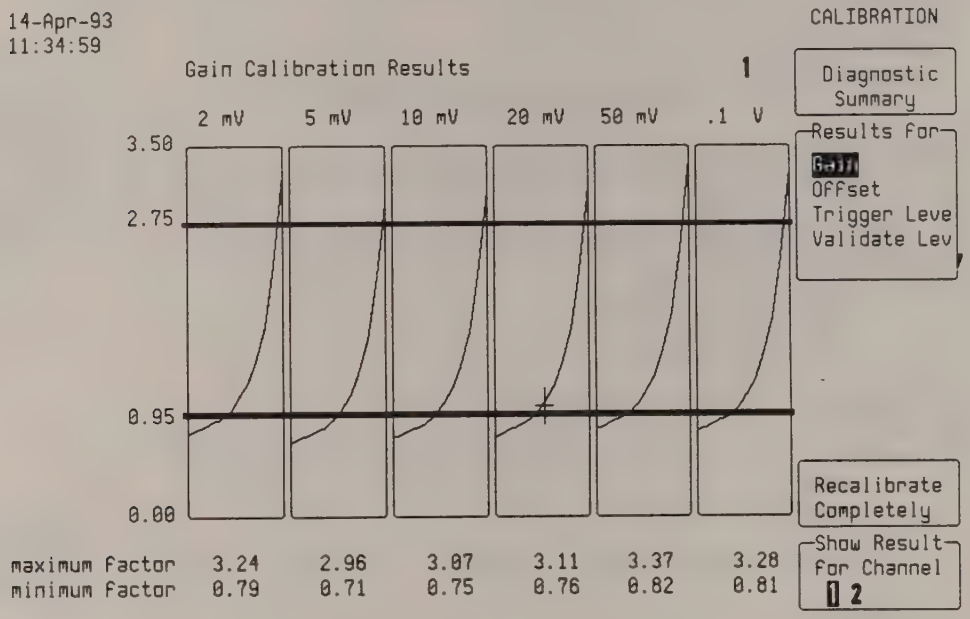
- In the Calibration Diagnostics select Diagnostic Results.



- Select Results for Gain, and Show Result for Channel 1
- During the adjustment push Recalibrate Completely
- Adjust Potentiometer R3081 in order to get

  Maximum Factor at 5 mV/div > 2.85

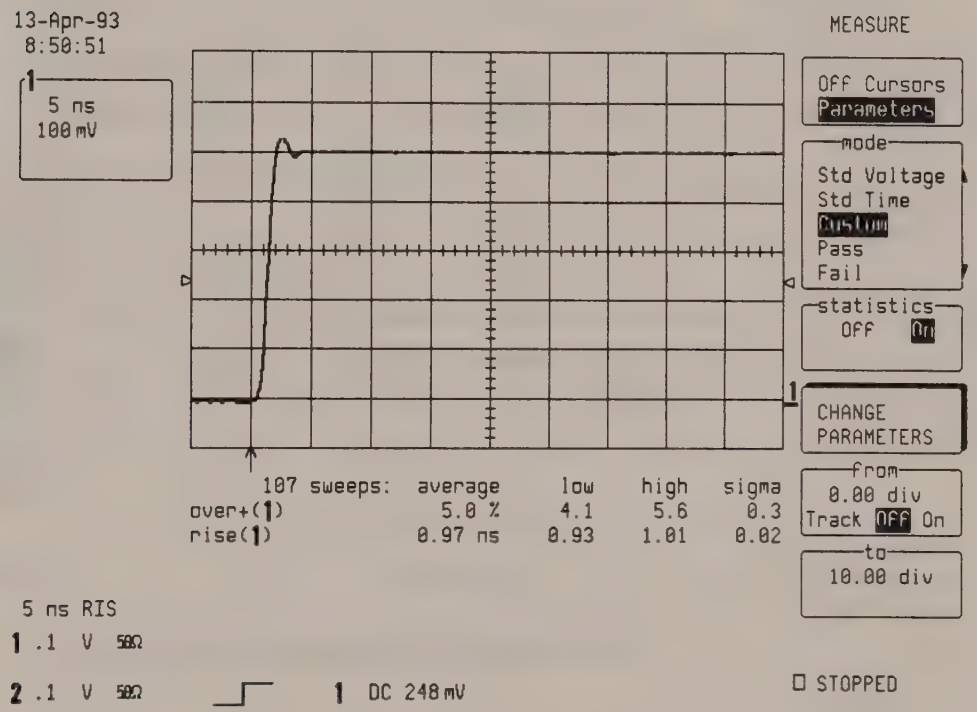
  Minimum Factor at 50 mV/div < 0.85



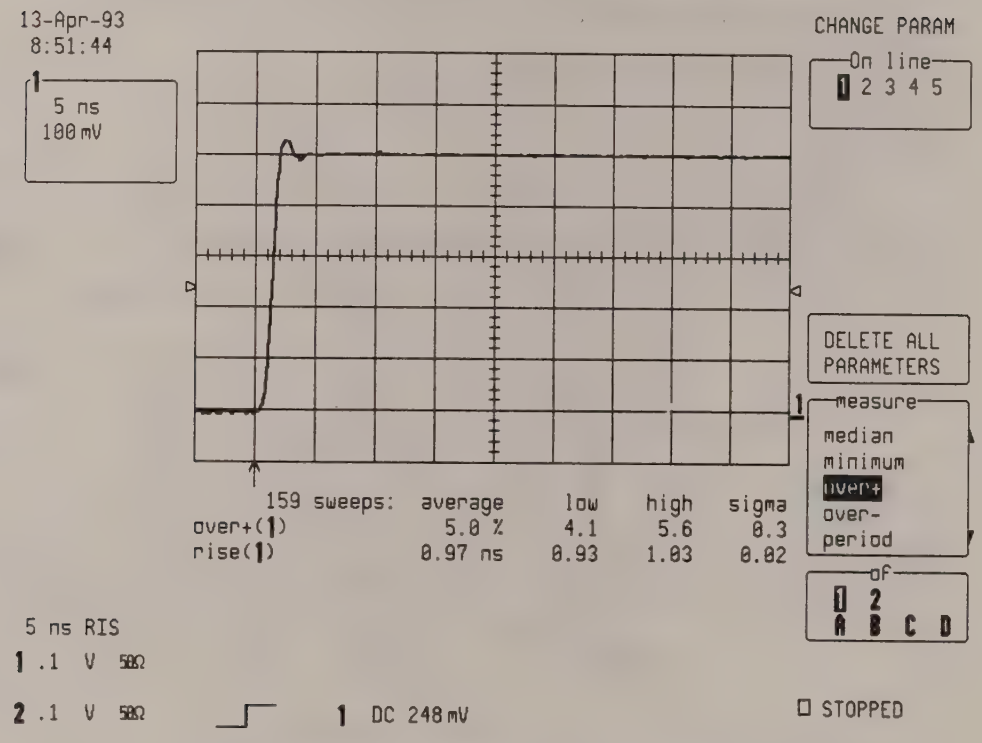
DC Gain Adjustment with R3081

7.6.2.6.4 Channel 1 Overshoot Calibration

- Apply the pulse generator LeCroy 4969 to Ch1, set to 61.05 us period
- Set DSO to 50 Ohm, DC, 100 mV/div, 5ns/div, RIS mode
- Press Cursors/Measure push button,
- Select Parameters menu
- Select Custom menu
- Select Change Parameters menu



- Select On Line 1, Measure Over+ of Ch1
- Select On Line 2, Rise of Ch1
- Adjust C3026 in order to get 5% overshoot +/- 1 %
- Rise time should be < 1.1 ns

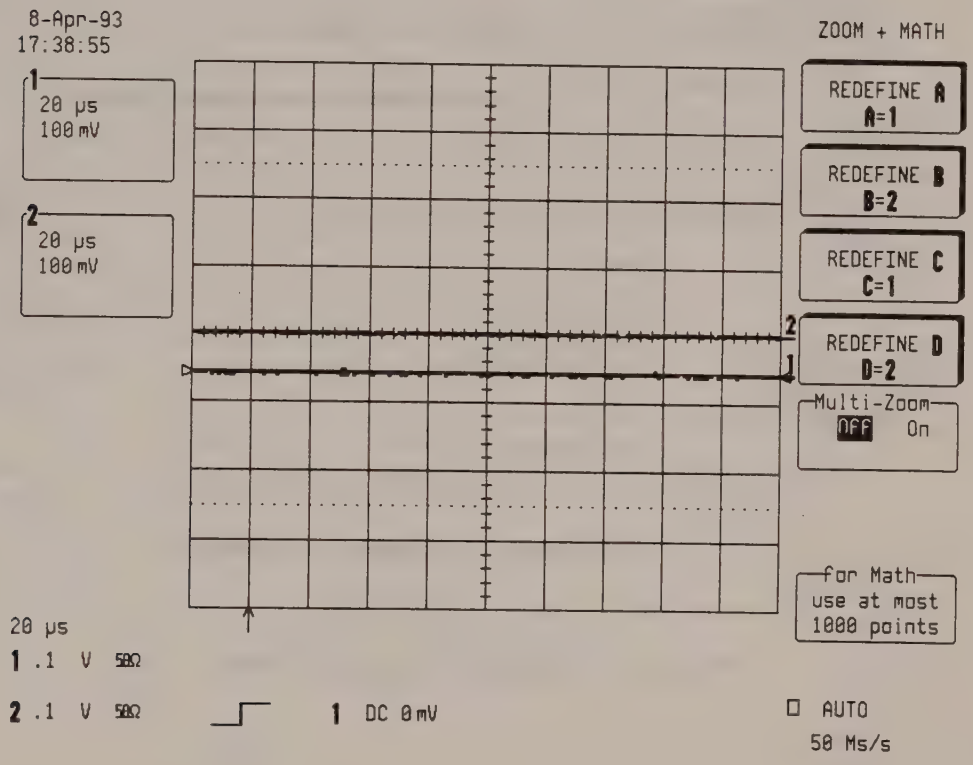


Ch1 Overshoot Compensation with C3026

7.6.2.7 Channel 2 HF Compensation

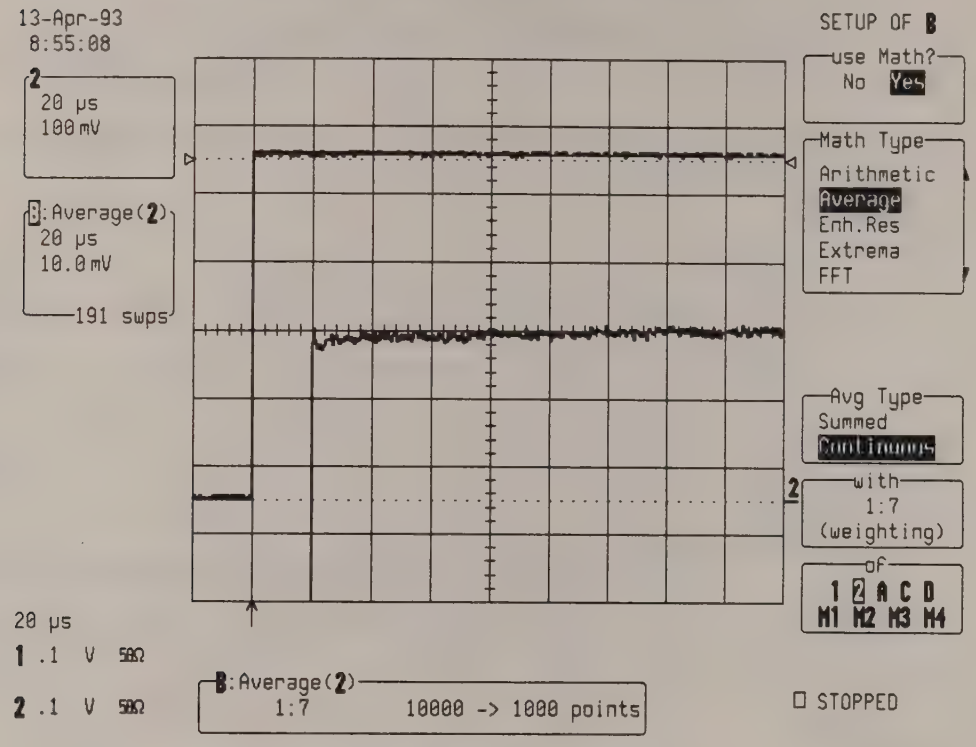
7.6.2.7.1 Channel 2 Input Buffer Flatness Adjustment

- Apply the fast risetime generator LeCroy 4969 (< 700 ps) to Ch2. Set pulser to low frequency (62.5 Ms).
- Set DSO to 50 Ohm, DC, 100mv/div, 20 us/div, Trigger on Ch2, Pos slope.
- Select Math Setup, Redefine B, Average type Summed or Continuous weight 1:7.



- With the vertical Zoom set B to 10 mV

- Adjust Pot R4042 to get a flat square wave, with the top of the overshoot at the same level as the settled value.



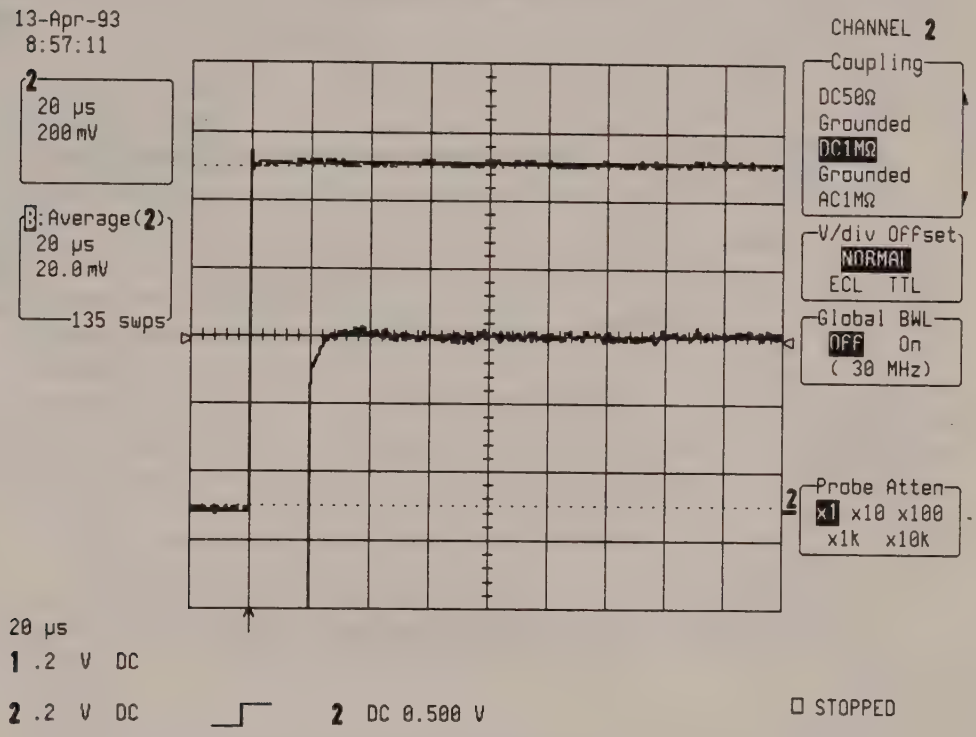
Flatness Adjustment with R4042

7.6.2.7.2 Channel 2 1/20 Attenuator Flatness Adjustment

- Set DSO to 1 MOhm, DC, 200 mV/div, 20 us/div, Trigger Ch2, Pos slope.

- Use Average mode type Summed or Continuous weight 1:7.

- Adjust the variable cap C4004 to get a slight negative slope, 1% or 1/2 division.

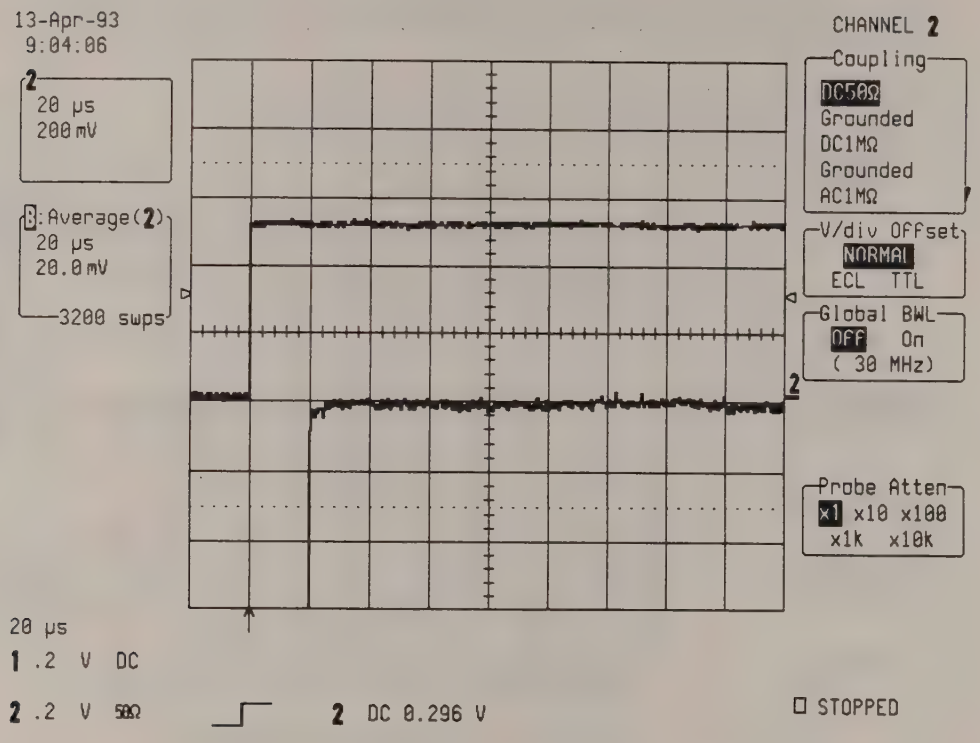


1 MOhm Flatness Adjustment with C4004

- Set DSO to 50 Ohm, DC, 200 mV/div.

- Check the flatness, typically a slight positive or negative slope :

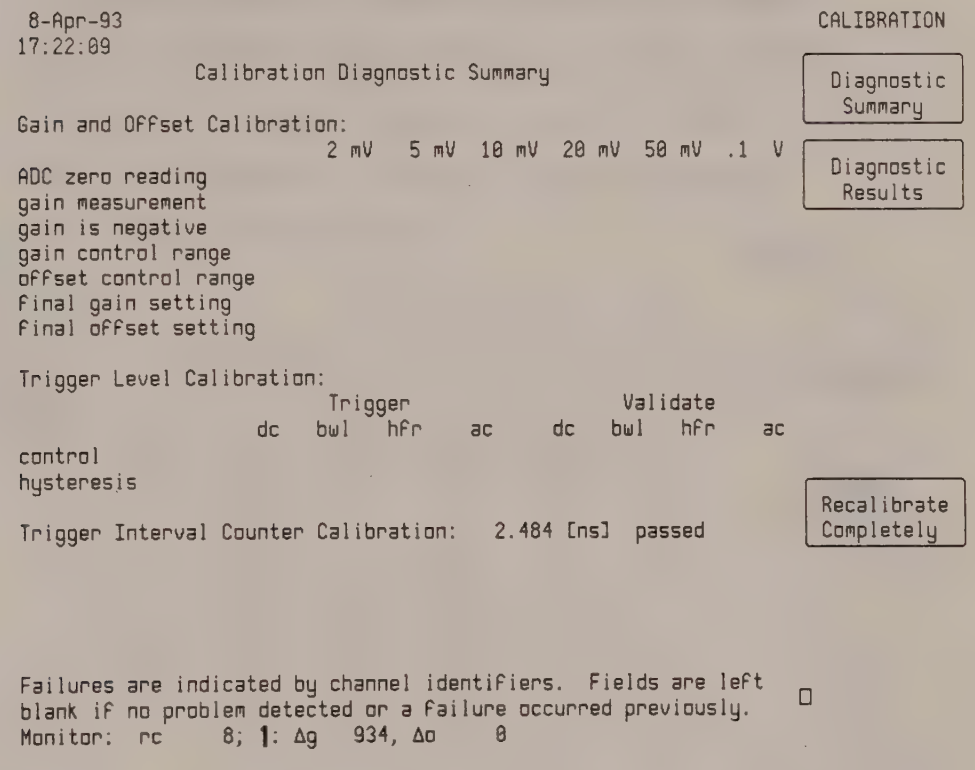
  +/- 1% or +/- 1/2 Division.



50 Ohm Flatness Verification

7.6.2.7.3 Channel 2 Input Buffer DC Gain Adjustment

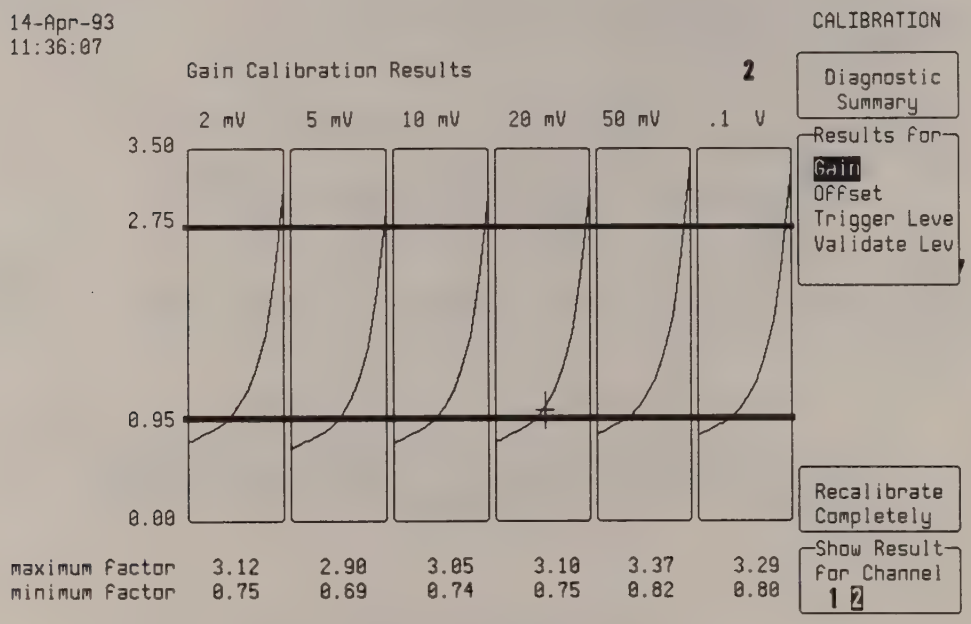
- In the Calibration Diagnostics select Diagnostic Results.



- Select Results for Gain, and Show Result for Channel 2.
- During the adjustment push Recalibrate Completely.
- Adjust Potentiometer R4081 in order to get:

  Maximum Factor at 5 mV/div > 2.85

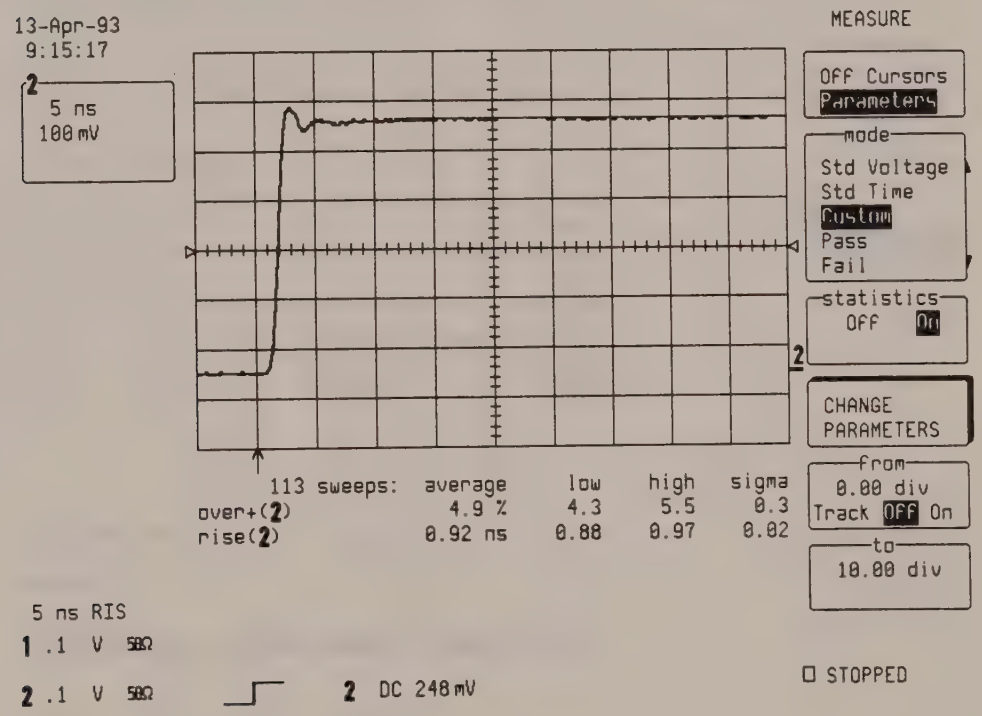
  Minimum Factor at 50 mV/div < 0.85



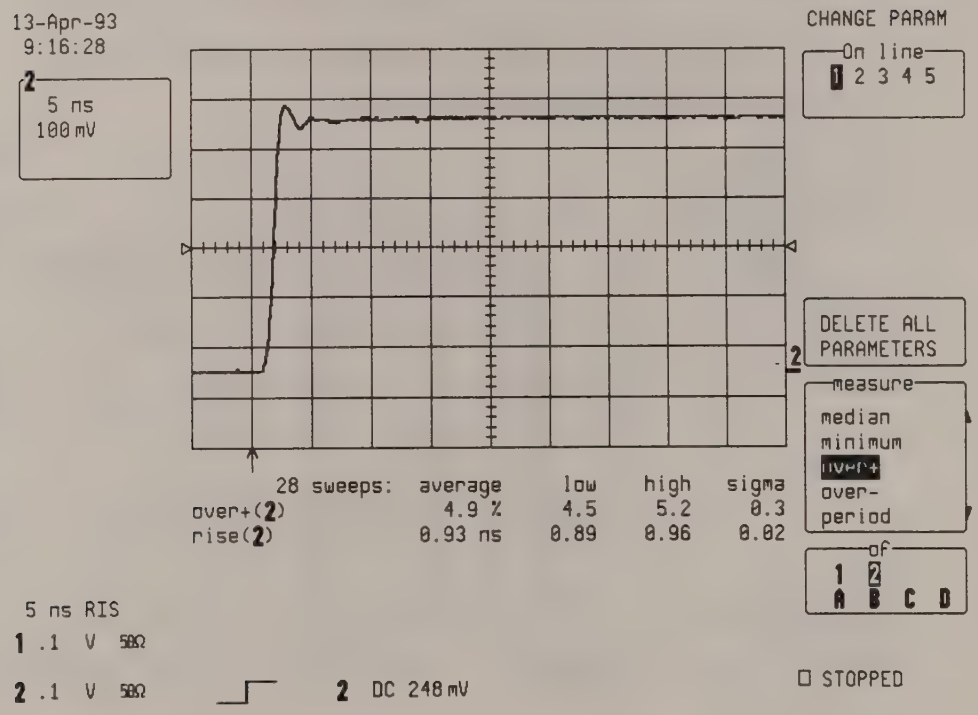
Ch2 DC Gain Adjustment with R4081

7.6.2.7.4 Channel 2 Overshoot Calibration

- Apply the pulse generator LeCroy 4969 to Ch2, set to 61.05 us period.
- Set DSO to 50 Ohm, DC, 100 mV/div, 5ns/div, RIS mode.
- Press Cursors/Measure push button.
- Select Parameters menu.
- Select Custom menu.
- Select Change Parameters menu.



- Select On Line 1, Measure Over+ of Ch2.
- Select On Line 2, Rise of Ch2
- Adjust C4026 in order to get 5% overshoot +/- 1 %.
- Rise time should be < 1.1 ns.



Ch2 Overshoot Compensation with C4026

7.6.2.10 Hysteresis Control

- Select the Calibration Diagnostics by simultaneously depressing the third and fourth push buttons, and then by depressing the fifth.

- Select Diagnostic Results.

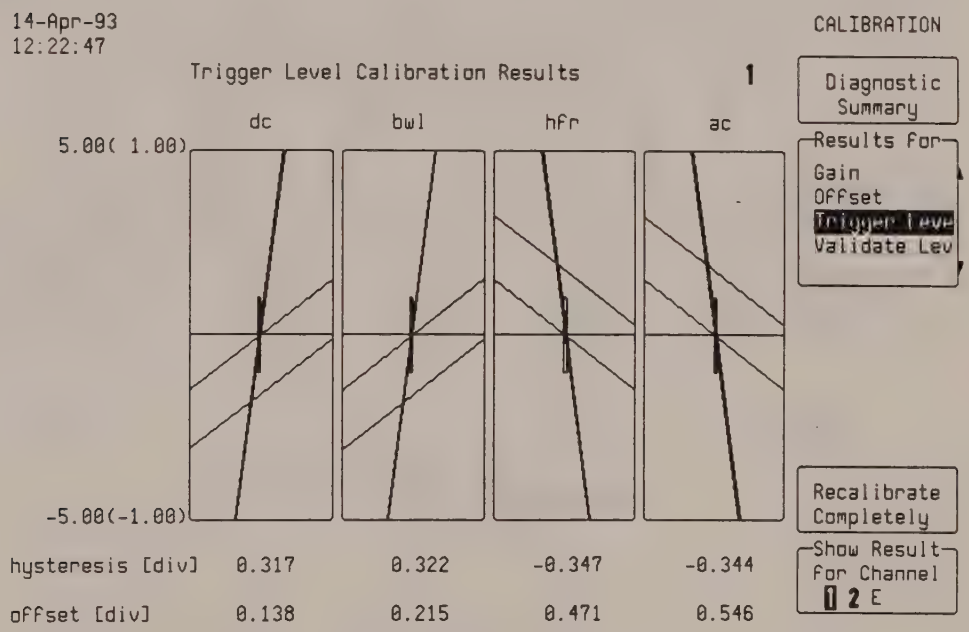
7.6.2.10.1 Trigger Level

- Select Trigger Level, and Show result for Channel 1.

- Adjust Potentiometer R5054 in order to get:

Hysteresis (div) = 0.35 div +/- 0.05 div (PCB Rev F and G)

or Hysteresis (div) = 0.50 div +/- 0.1 div (PCB Rev C and D)

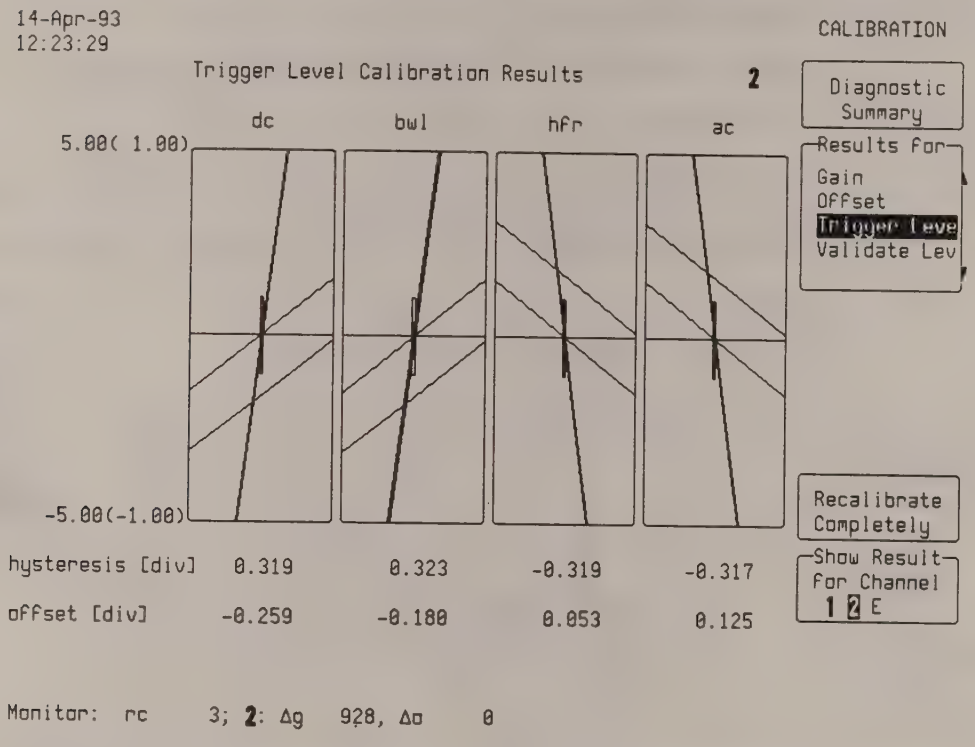


Ch1 Trigger Level

- Select Show Result for Channel 2

Hysteresis (div) = 0.35 div +/- 0.05 div (PCB Rev F and G)

or Hysteresis (div) = 0.50 div +/- 0.1 div (PCB Rev C and D)

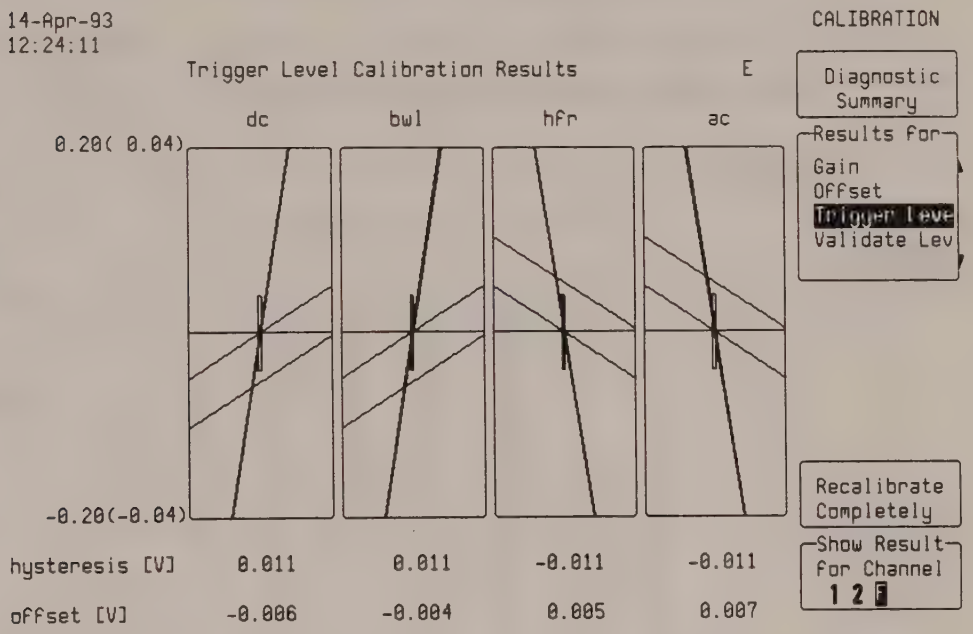


Ch2 Trigger Level

- Select Show Result for External Trigger

Check the Hysteresis (V) = 0.012 +/- 0.002 (PCB Rev F and G)

or Check the Hysteresis (V) = 0.02 V +/- 0.005 (PCB Rev C and D)



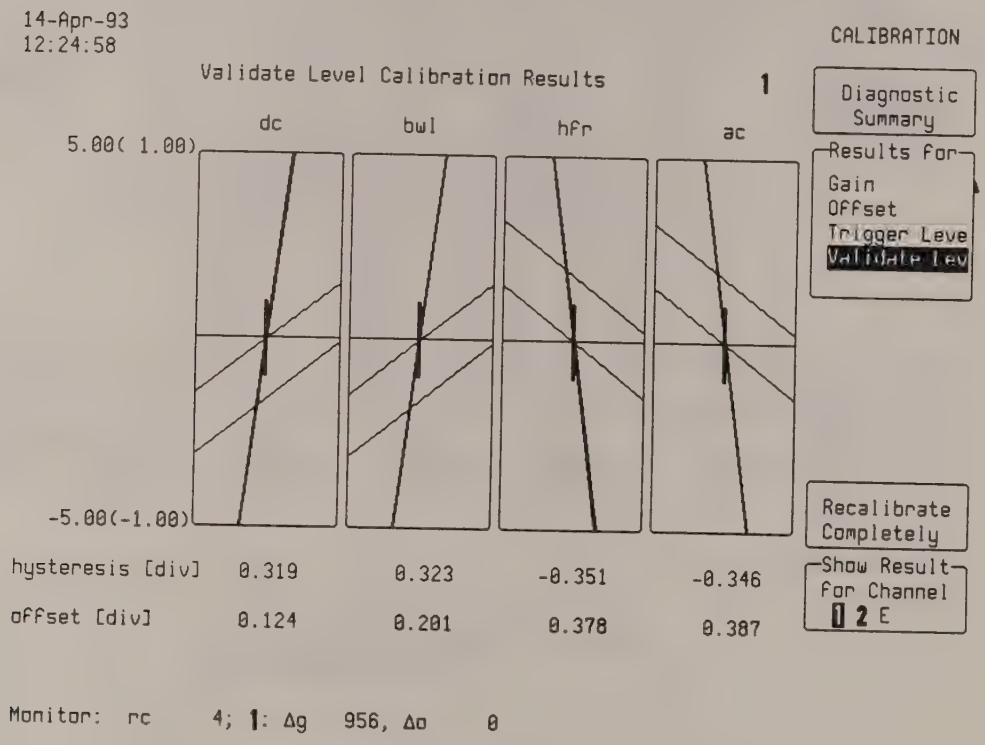
External Trigger Level

7.6.2.10.2 Validate Level

- Select Validate Level, and Show Result for Channel 1
- Adjust Potentiometer R5051 to get :

Hysteresis (div) = 0.35 div +/- 0.05 div (PCB Rev F and G)

or Hysteresis (div) = 0.50 div +/- 0.1 div (PCB Rev C and D)

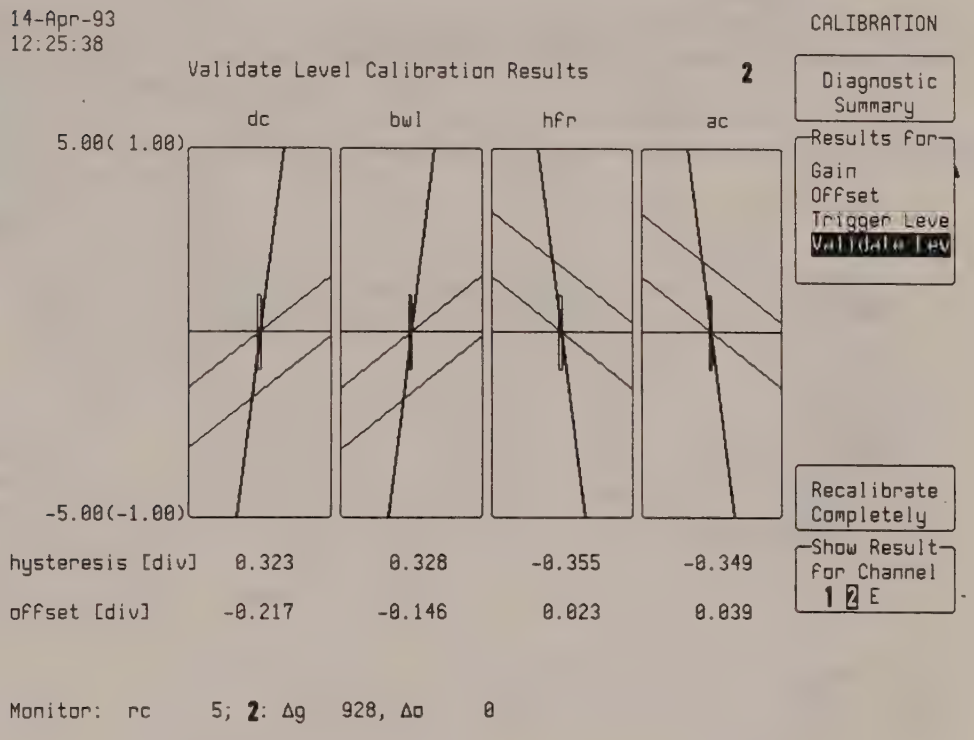


Ch1 Validate Trigger

- Select Show Result for Channel 2

  Check : 0.30 < Hysteresis < 0.40 for PCB Rev F and G

  Check : 0.4 < Hysteresis < 0.6 for PCB Rev C and D

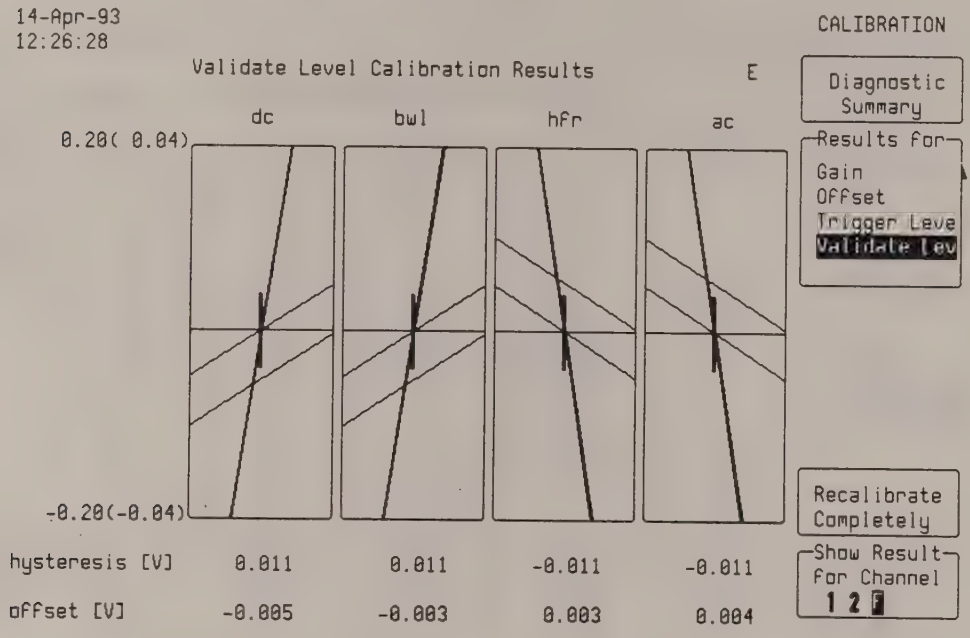


Ch2 Validate Level

- Select show result for External Trigger

Check : 0.010 < Hysteresis < 0.014 for PCB Rev F and G

or Check : 0.015 < Hysteresis < 0.025 for PCB Rec C and D



External Trigger Validate Level

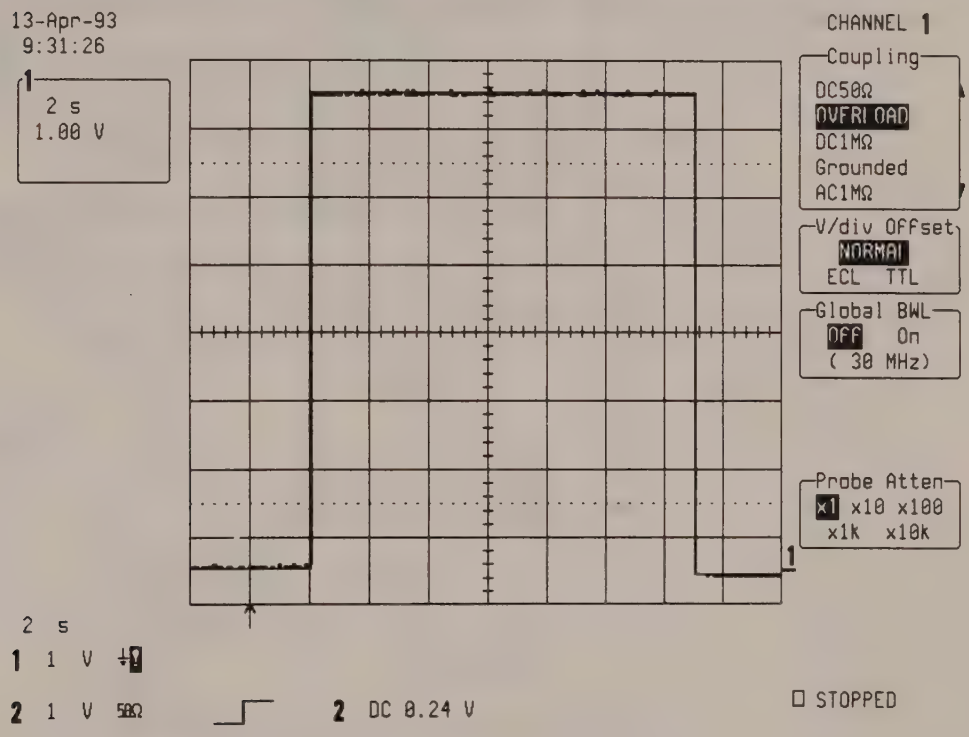
7.6.2.11 50 Ohm Overload Protection Adjustment

- Set Channel 1 and Channel 2 : 50 Ohm, 1V/div, 2s/div, Auto Trigger, Pos.

- Apply 7.07 V (1 Watt) to the channel to be tested.

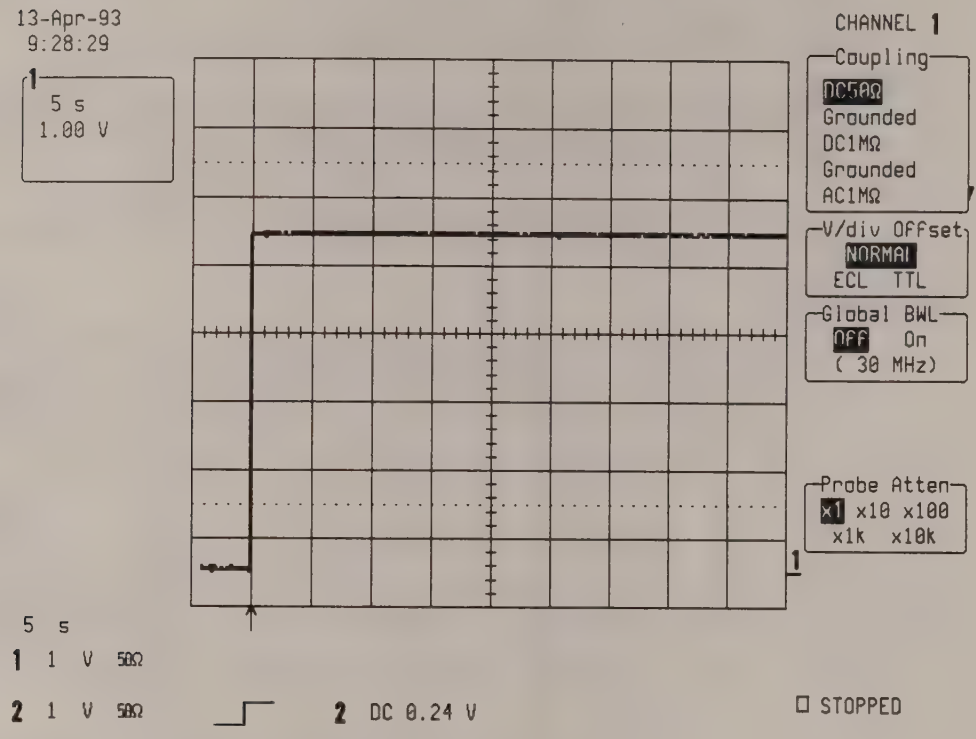
- Adjust the overload detection potentiometer R3013 for Channel 1, and R4013 for Channel 2 through the opening aluminium cover, such that the overload trips within 10 to 15 seconds.

- Turn the potentiometer clockwise if it's too slow or counterclockwise if it's too fast.



Ch1 Overload adjustment with R3013

- Apply 5 V (0.5 Watt) to the channel to be tested, and check that the overload doesn't trip after 40 seconds.



Ch1 Overload verification

7.6.3 93XX-Display Adjustment Procedure

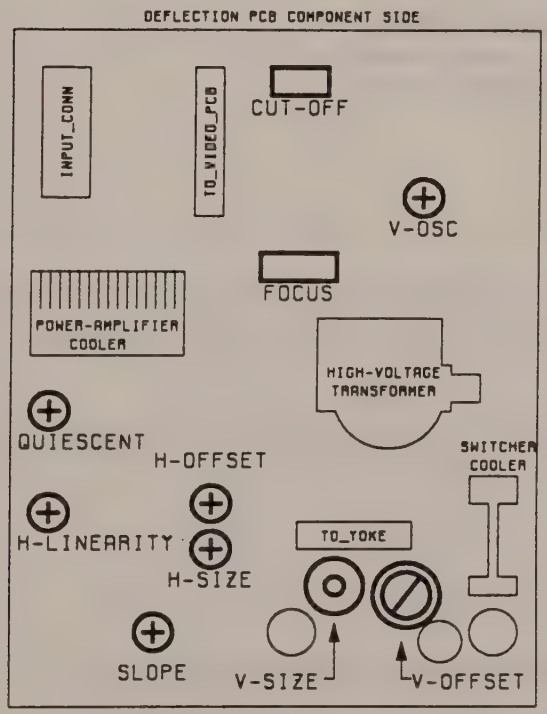
7.6.3.1 Introduction

There is a total of 12 potentiometers or variable coils to adjust the deflection and video board.

Deflection : (10 adjustments)

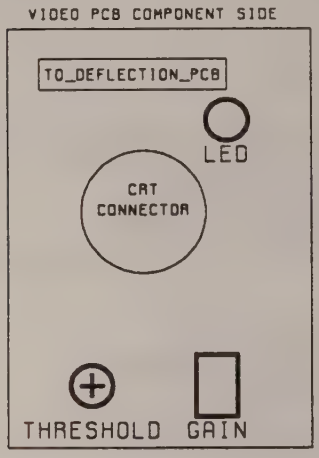
- Vosc : Frequency of the vertical oscillator.
- Slope : Speed of the horizontal ramp.
- Focus : Focus of the screen.
- Cut off : Cathode ray tube cut off.
- Quiescent: Standby current of the horizontal deflection amplifier.

- H Linearity: Horizontal linearity.
- H Size : Horizontal size (Max 165mm).
- H Offset : Horizontal position.
- V Size : Vertical size (Max 120mm).
- V Offset : Vertical position.



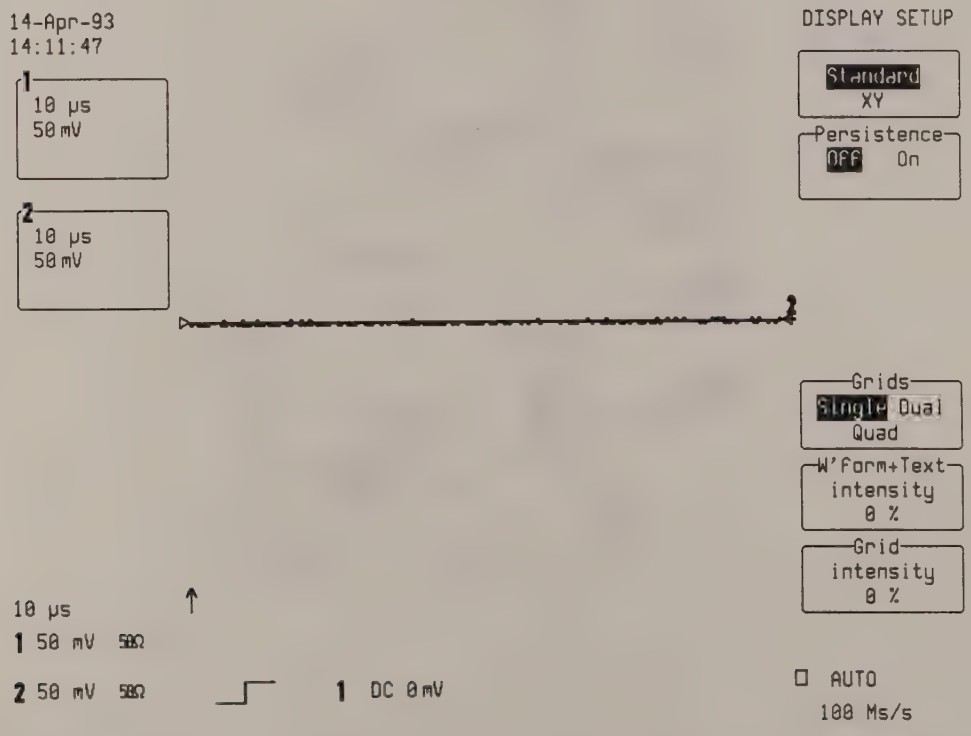
Video: (2 adjustments)

- Threshold: Level of the video board.
- Gain : Intensity of the screen.



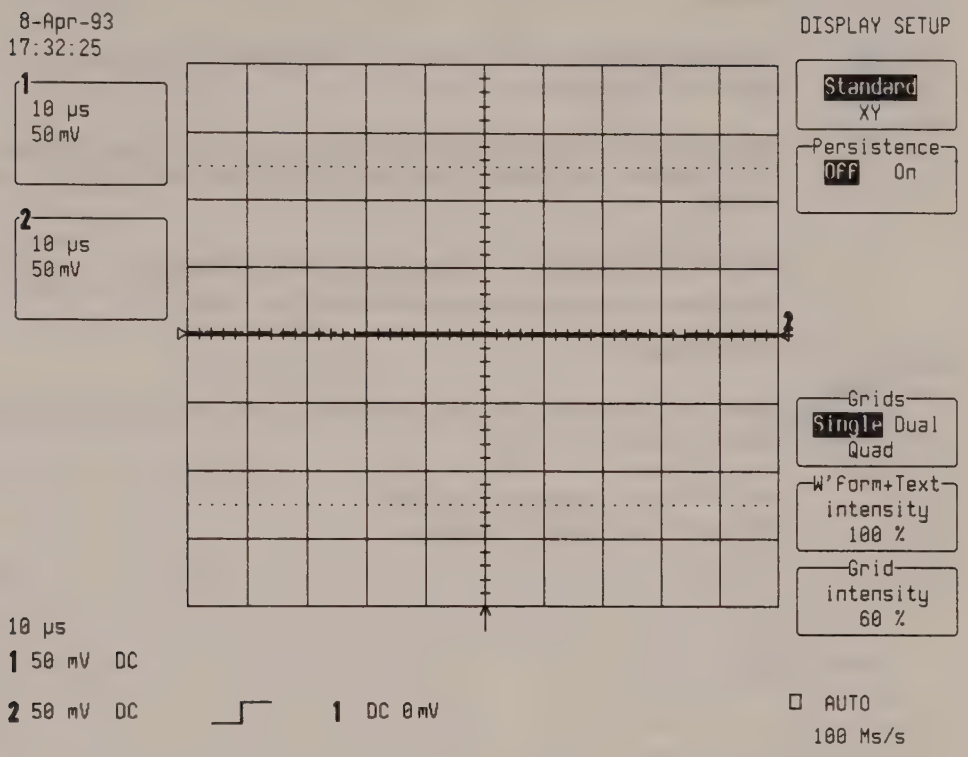
7.6.3.2 Coarse Adjustment

- Depress display button.
- Set W'form + text intensity to 0%.
- Set grid intensity to 0%.

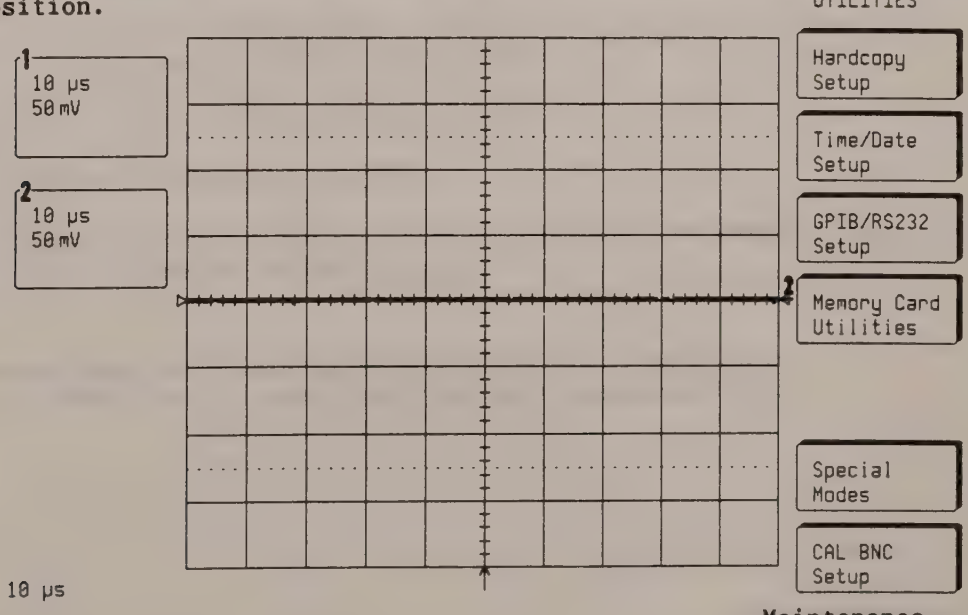


Adjust threshold potentiometer on the video board to see the red led just appear on.

- Set W'form intensity to 100%.
- Set grid intensity to 60%.



Adjust H-size, H-offset, V-size, V-offset to center the image in the screen.
The vertical position should be adjusted to get the push buttons of the front panel in front of the software menus, use the utilities set up.
The small magnets mounted on the deflection yoke influence the vertical position.



- Turn the quiescent potentiometer clockwise until the default of the horizontal lines just disappears from the vertical center of the screen.

- Increase the cut off until a vertical line appears on the right side of the screen.

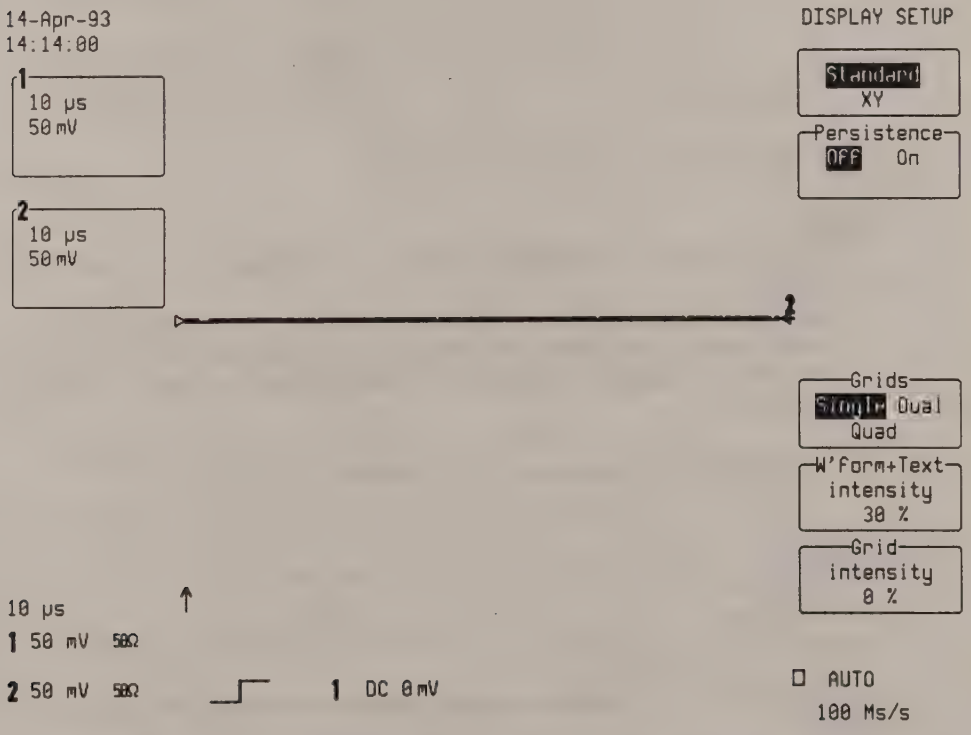
- Adjust the slope potentiometer to get 5mm gap between the highlighted vertical line and the right border of the selection menus.

- Adjust H-linearity to get the best linearity.

7.6.3.3 Fine Adjustment

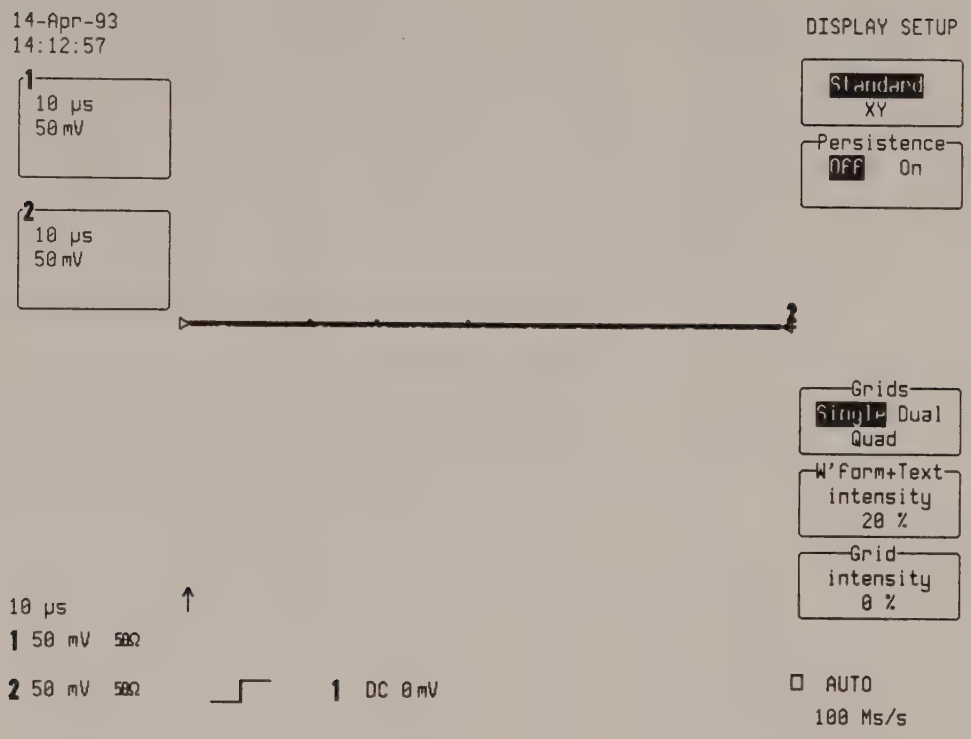
The final adjustment of the intensity cut off and focus must be made in a dark room.

- Set W'form intensity to 30%.
- Set grid intensity to 0%.



- Adjust the cut off potentiometer until the highlighted vertical line disappears from the right side of the screen.

- Set W'form intensity to 20%.



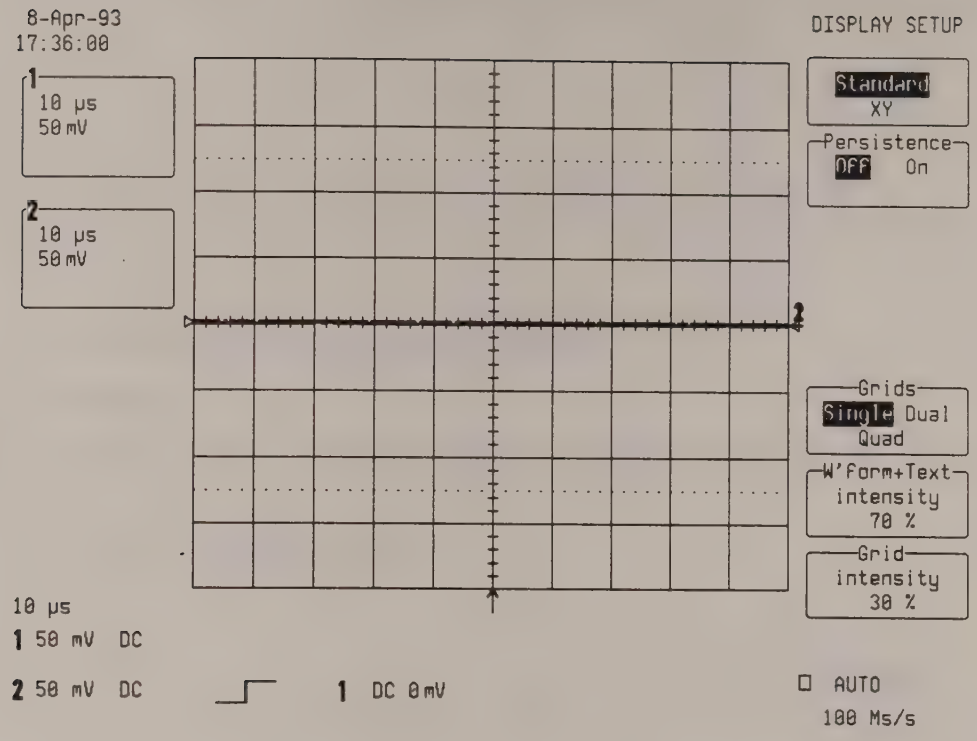
- Display channel 1 and 2 traces.

- On the video board adjust the gain potentiometer (intensity) in order to get the text just readable.

- Set W'form + text intensity to 70%.

- Set grid intensity to 30%.

- Adjust the focus (usually fully clockwise) for most uniform focus over the entire screen.



- In a standard luminosity environment set W'form + text to 90%, and grid intensity to 60%.
- verify the intensity, focus, and contrast adjustment, for best definition of the displayed text.

C A U T I O N

never change the Vosc calibration.

9310/9310M/9310L

MFG,RE,290,2 LeCroy Division ITI Production Database PLANT CODE: ITI_GVA REQUESTER: CHRISTIAN_S
29-MAR-1993 11:18 BILL OF MATERIALS REPORT PAGE NO: 1

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 1
FINISHED GOODS-MANUFACTURED
PART: 9310
DESC: 300 MHz DUAL 100Ms/s DSO , 10K UOM: EA SC: M REV: 1

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
205750000	IC AND-OR GATE ARRAY 16V8		11	P	EA	1.00	1.000	20/12/91	99/99/99	
554500001	TAPPING SCREW W/U-THREAD		10	P	EA	2.00	1.000	10/09/91	99/99/99	
709310013	FRONT LABEL 9310	B	9	B	EA	1.00	1.000	09/09/91	99/99/99	
709310913	SERIAL NUMBER PLATE 9310	A	8	B	EA	1.00	1.000	09/09/91	99/99/99	
ACCESSORIES-9310	ACCESSORIES FOR 9310	8	7	R	EA	1.00	1.000	00/00/00	99/99/99	
F9300-1	PROCESSOR CARD WITH 1Mb RAM	G	2	R	EA	1.00	1.000	00/00/00	99/99/99	
F9300-4	GPIB + RS232 INTERFACE CARD	A	4	R	EA	1.00	1.000	00/00/00	99/99/99	
F9310-3	MAIN CARD DUAL 100Ms/s , 10K	O	5	R	EA	1.00	1.000	00/00/00	99/99/99	
F9310-5	DUAL CHANNEL FRONT PANEL 9300	5	6	R	EA	1.00	1.000	00/00/00	99/99/99	
M93XX	MECHANICAL FOR 93XX-SERIES	13	1	R	EA	1.00	1.000	09/09/91	99/99/99	

MFG,RE,290,2 LeCroy Division ITI Production Database PLANT CODE: ITI_GVA REQUESTER: CHRISTIAN_
15-APR-1993 11:36 BILL OF MATERIALS REPORT PAGE NO:

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 15/04/93

CLASS CODE: 1
FINISHED GOODS-MANUFACTURED
PART: 9310M
DESC: 300 MHz DUAL 100Ms/s DSO , 50K UOM: EA SC: M REV: 1

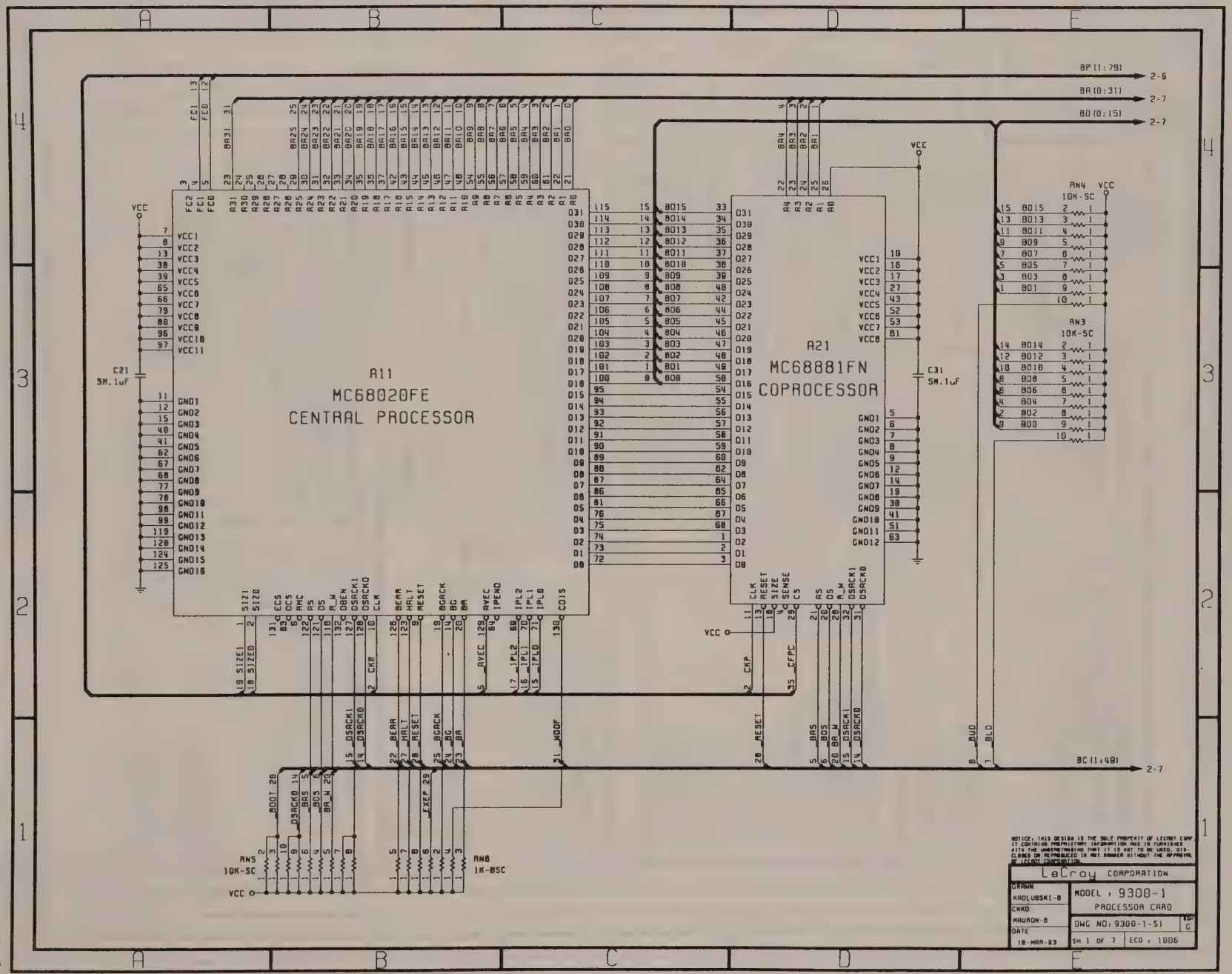
COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
205750000	IC AND-OR GATE ARRAY 16V8		11	P	EA	1.00	1.000	20/12/91	99/99/99	
554500001	TAPPING SCREW W/U-THREAD		10	P	EA	2.00	1.000	10/09/91	99/99/99	
709310913	SERIAL NUMBER PLATE 9310	A	8	B	EA	1.00	1.000	09/09/91	99/99/99	
709310M13	FRONT LABEL 9310M	B	9	B	EA	1.00	1.000	09/09/91	99/99/99	
ACCESSORIES-9310	ACCESSORIES FOR 9310	9	7	R	EA	1.00	1.000	00/00/00	99/99/99	
F9300-4	GPIB + RS232 INTERFACE CARD	A	4	R	EA	1.00	1.000	00/00/00	99/99/99	
F9310-5	DUAL CHANNEL FRONT PANEL 9300	5	6	R	EA	1.00	1.000	00/00/00	99/99/99	
F9310M-3	MAIN CARD DUAL 100Ms/s , 50K	O	5	R	EA	1.00	1.000	00/00/00	99/99/99	
F9314M-1	PROCESSOR CARD WITH 2Mb RAM	G	2	R	EA	1.00	1.000	00/00/00	99/99/99	
M93XX	MECHANICAL FOR 93XX-SERIES	15	1	R	EA	1.00	1.000	09/09/91	99/99/99	

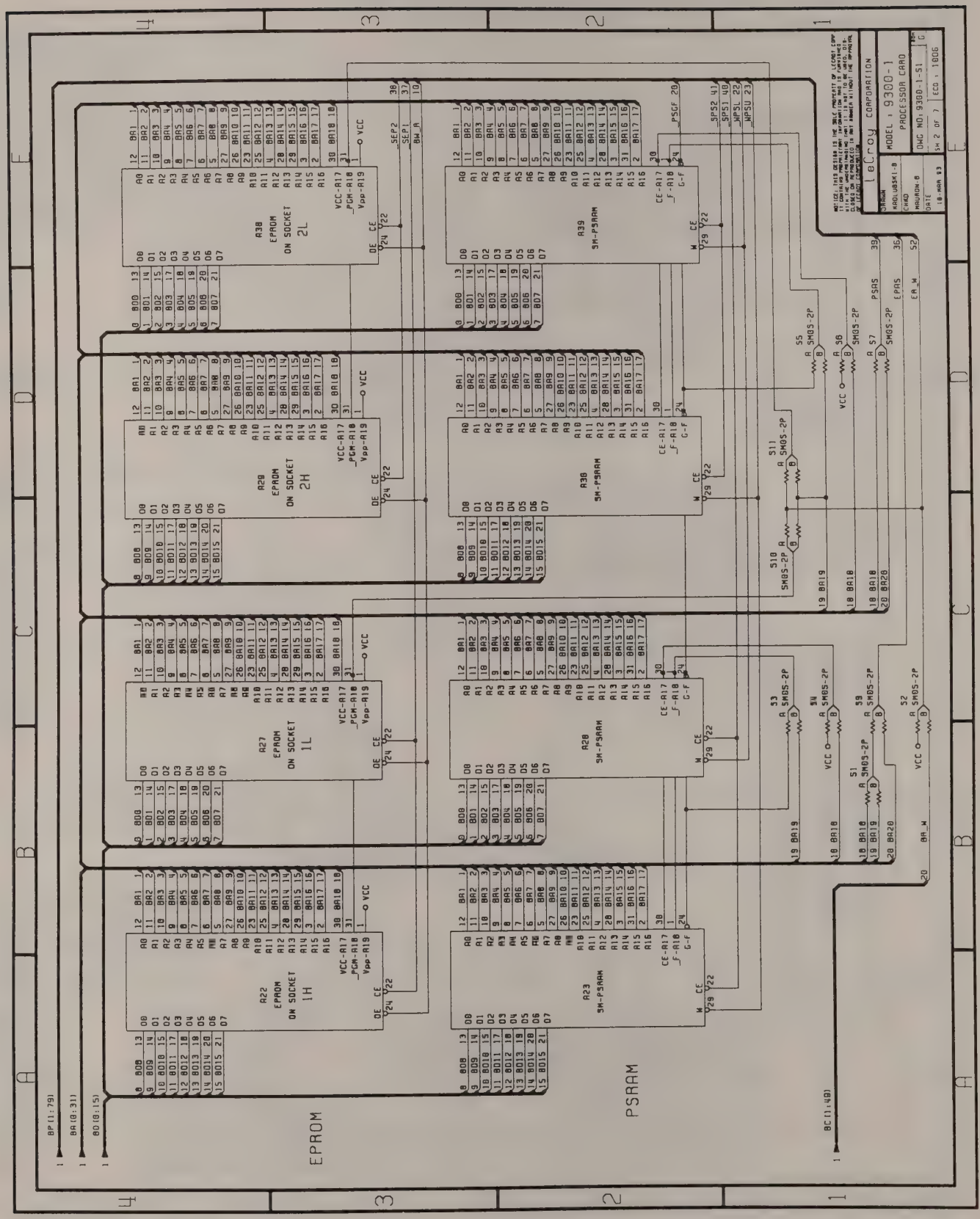
MFG,RE,290,2 LeCroy Division ITI Production Database PLANT CODE: ITI_GVA REQUESTER: CHRISTIAN
15-APR-1993 11:36 BILL OF MATERIALS REPORT PAGE NO:

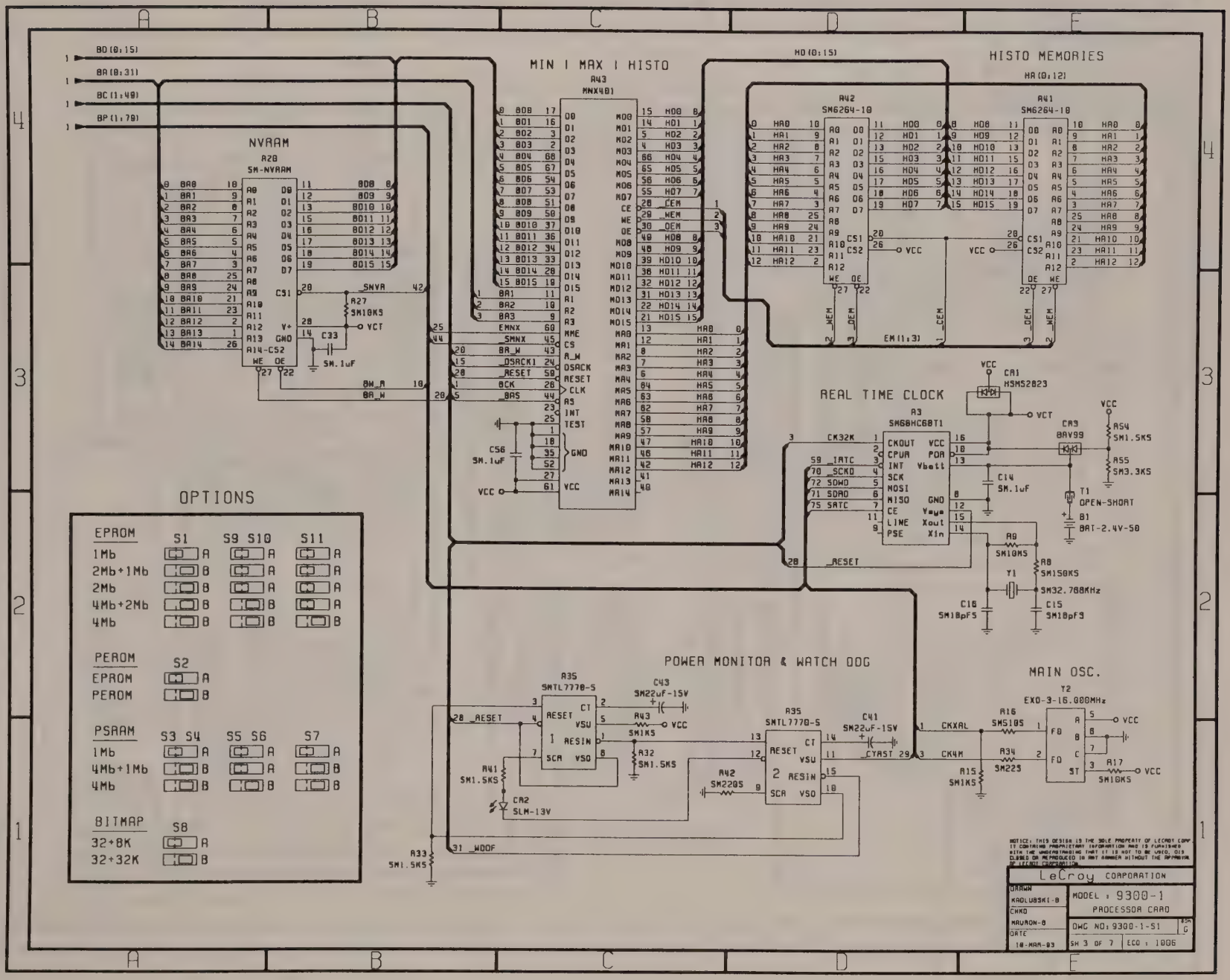
SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 15/04/93

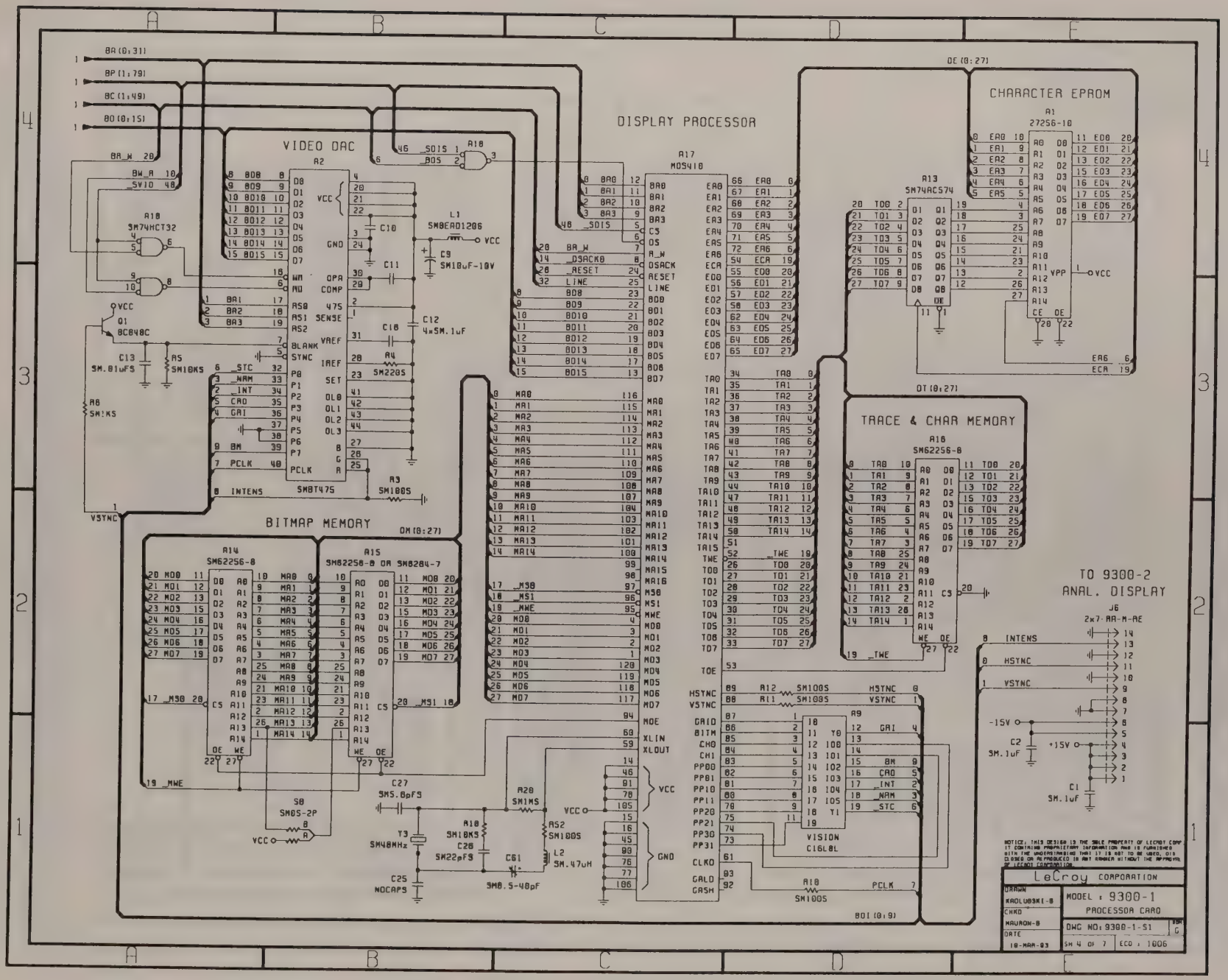
CLASS CODE: 1
FINISHED GOODS-MANUFACTURED
PART: 9310L
DESC: 300 MHz DUAL 100Ms/s DSO , 1M UOM: EA SC: M REV: 1

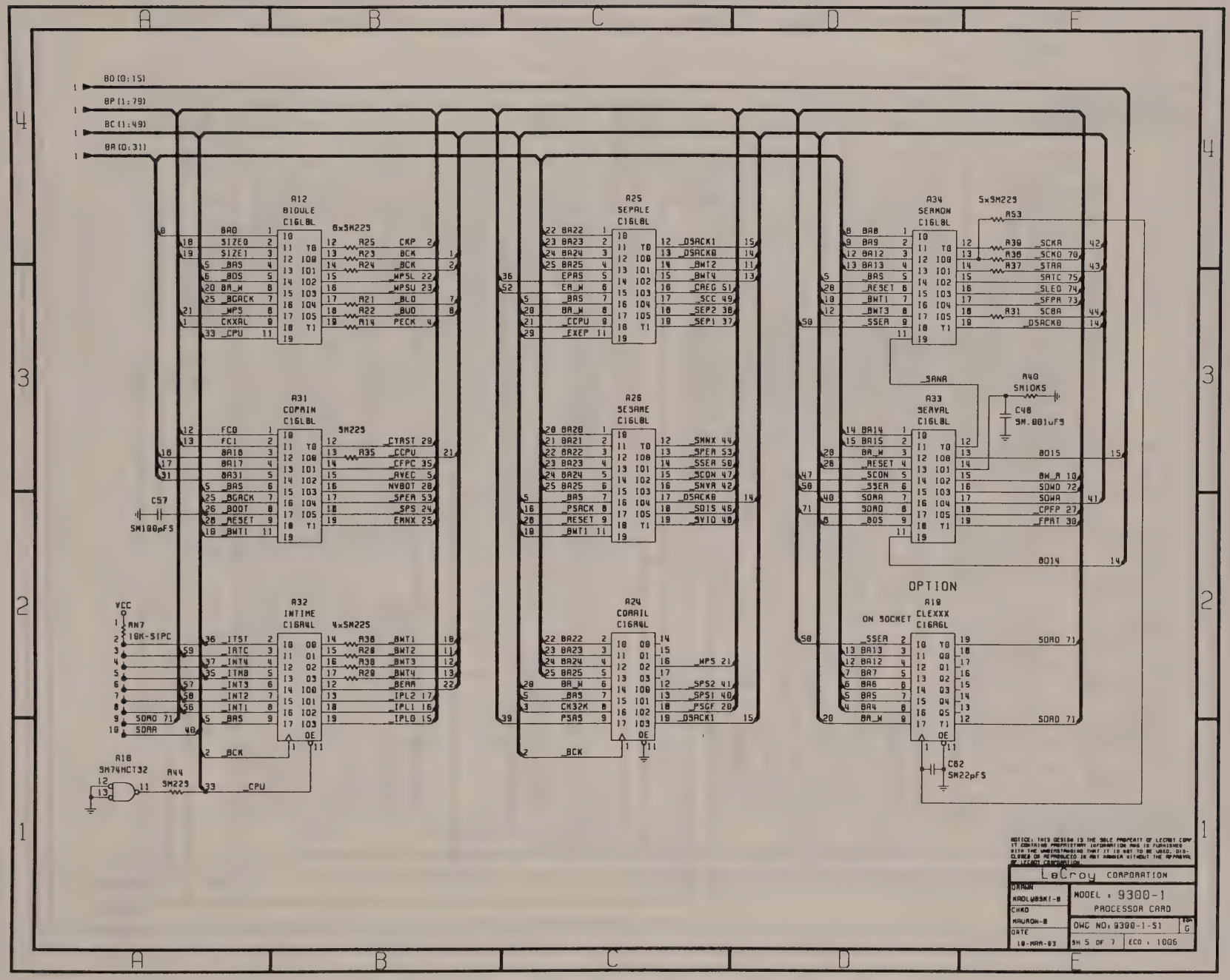
COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
205750000	IC AND-OR GATE ARRAY 16V8		11	P	EA	1.00	1.000	20/12/91	99/99/99	
554500001	TAPPING SCREW W/U-THREAD		10	P	EA	2.00	1.000	10/09/91	99/99/99	
709310913	SERIAL NUMBER PLATE 9310	A	8	B	EA	1.00	1.000	09/09/91	99/99/99	
709310L13	FRONT LABEL 9310L	B	9	B	EA	1.00	1.000	09/09/91	99/99/99	
ACCESSORIES-9310	ACCESSORIES FOR 9310	9	7	R	EA	1.00	1.000	00/00/00	99/99/99	
F9300-4	GPIB + RS232 INTERFACE CARD	A	4	R	EA	1.00	1.000	00/00/00	99/99/99	
F9310-5	DUAL CHANNEL FRONT PANEL 9300	5	6	R	EA	1.00	1.000	00/00/00	99/99/99	
F9310L-3	MAIN CARD DUAL 100Ms/s , 1M	O	5	R	EA	1.00	1.000	00/00/00	99/99/99	
F9314M-1	PROCESSOR CARD WITH 2Mb RAM	G	2	R	EA	1.00	1.000	00/00/00	99/99/99	
M93XX	MECHANICAL FOR 93XX-SERIES	15	1	R	EA	1.00	1.000	09/09/91	99/99/99	


A11
MC68020FE
CENTRAL PROCESSOR
A21
MC68881FN
COPROCESSOR
C21
SM.1uF
C31
SM.1uF
AN4
10K-SC
AN3
10K-SC
AN5
10K-SC
AN6
1K-BSC
VCC
BP(1:79)
BA(0:31)
BD(0:15)
BC(1:49)
2-6
2-7
2-7
2-7
LeCroy CORPORATION
DRAWN
KADLUBSKI-B
CHKD
MAURON-B
DATE
18-MAR-83
MODEL : 9300-1
PROCESSOR CARD
DWG NO: 9300-1-S1
REV C
SH 1 OF 7
ECO : 1006


EPROM
PSRAM
BP(1:79)
BA(0:31)
BD(0:15)
BC(1:48)
A22 EPROM ON SOCKET 1H
A27 EPROM ON SOCKET 1L
A20 EPROM ON SOCKET 2H
A38 EPROM ON SOCKET 2L
A23 SM-PSRAM
A28 SM-PSRAM
A30 SM-PSRAM
A39 SM-PSRAM
S1 SM03-2P
S2 SM03-2P
S3 SM03-2P
S4 SM03-2P
S5 SMOS-2P
S6 SMOS-2P
S7 SMOS-2P
S10 SMOS-2P
S11 SMOS-2P
VCC-A17
_PGM-A18
Vpp-A19
OE CE
W CE
G-F
_F-A18
CE-A17
_SEP2
_SEP1
_SPS2
_SPS1
_WPSL
_WPSU
_PSGF
EPAS
CA_W
BA_W
leCroy CORPORATION
MODEL : 9300-1
PROCESSOR CARD
DWG NO: 9300-1-S1
SH 2 OF 7 | ECO : 1806
DRAWN
MAU:U&SK1-8
CHKD
MAU:MDH-8
DATE
18-MAR 93


MIN I MAX I HISTO
HISTO MEMORIES
NVRAM
REAL TIME CLOCK
POWER MONITOR & WATCH DOG
MAIN OSC.
OPTIONS
EPROM
1Mb
2Mb+1Mb
2Mb
4Mb+2Mb
4Mb
PEROM
EPROM
PEROM
PSRAM
1Mb
4Mb+1Mb
4Mb
BITMAP
32+8K
32+32K
LeCroy CORPORATION
MODEL : 9300-1
PROCESSOR CARD
DWG NO: 9300-1-S1
SH 3 OF 7
ECO : 1006
DRAWN
KADLUBSKI-B
CHKD
MAVRON-B
DATE
18-MAR-93


DISPLAY PROCESSOR
VIDEO DAC
CHARACTER EPROM
BITMAP MEMORY
TRACE & CHAR MEMORY
TO 9300-2
ANAL. DISPLAY
VISION
C16L8L
LeCroy CORPORATION
MODEL : 9300-1
PROCESSOR CARD



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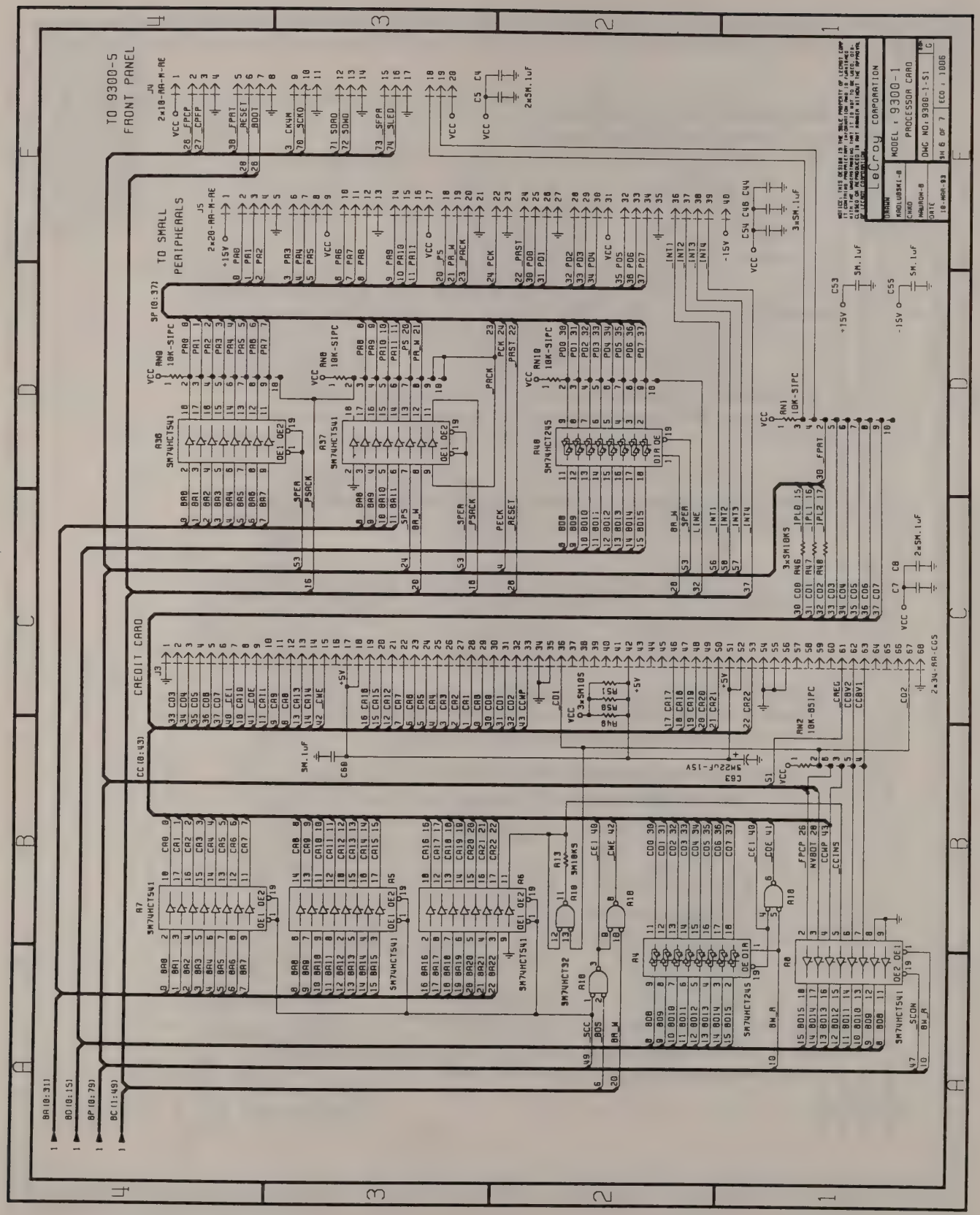
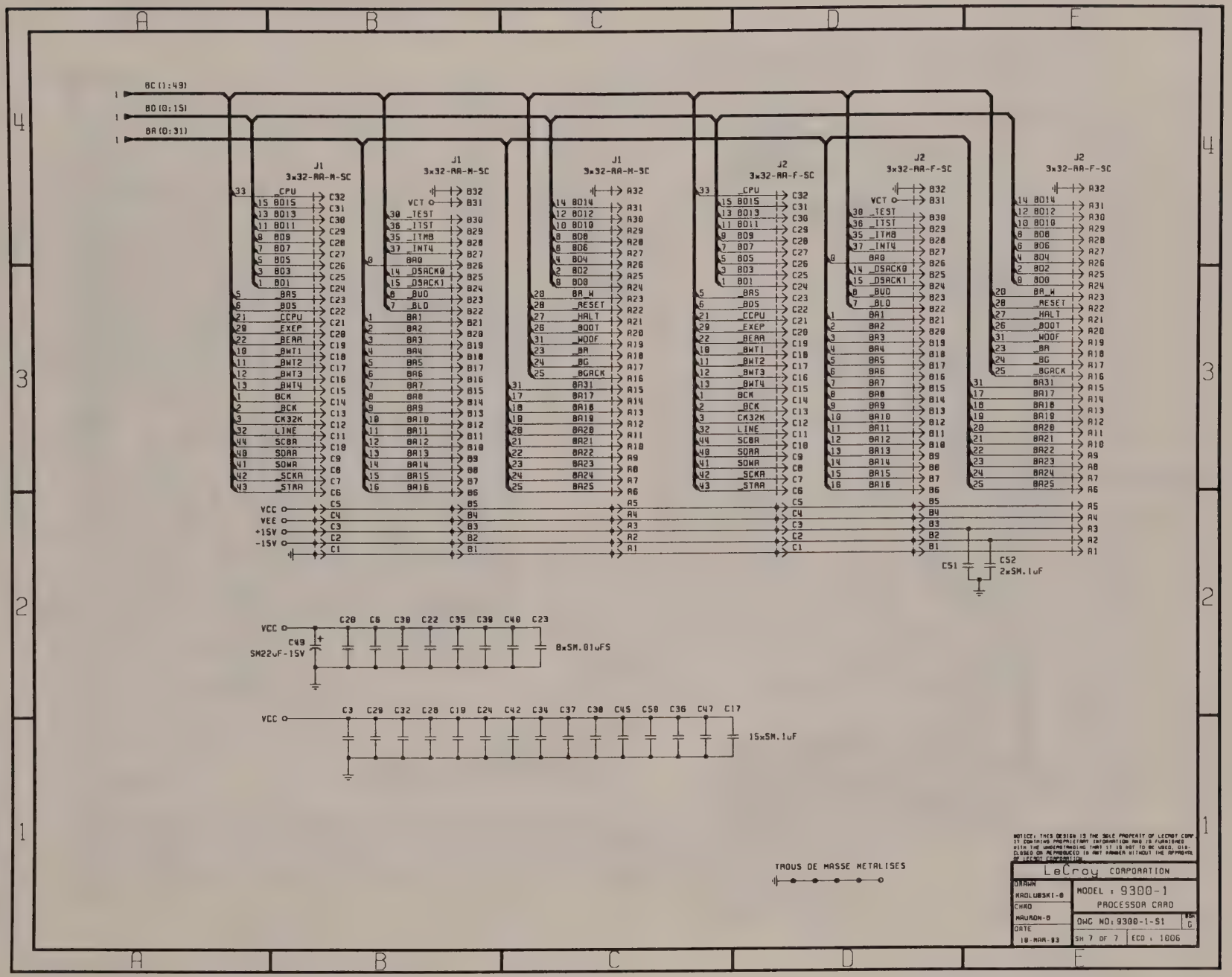
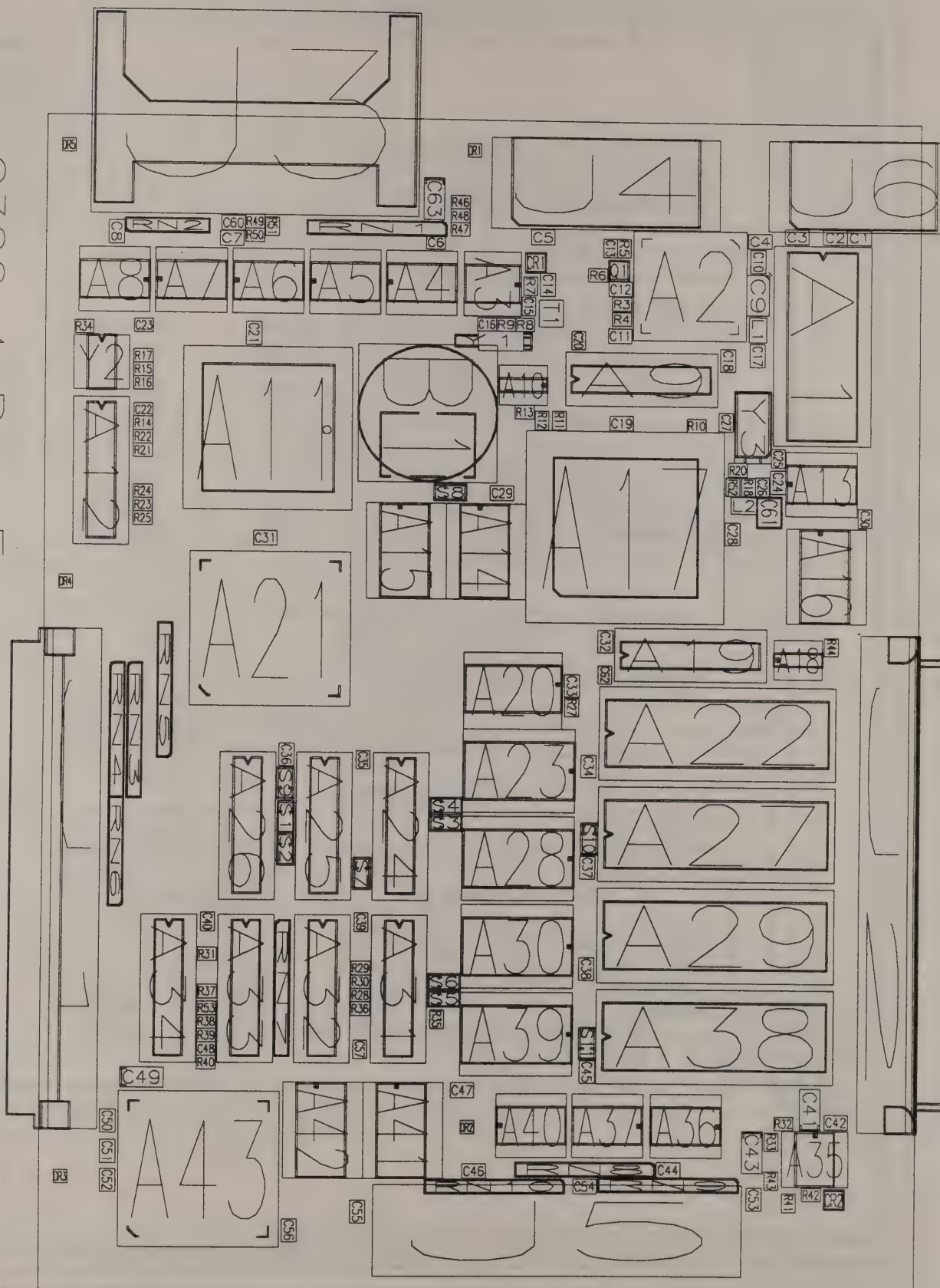
LeCroy CORPORATION

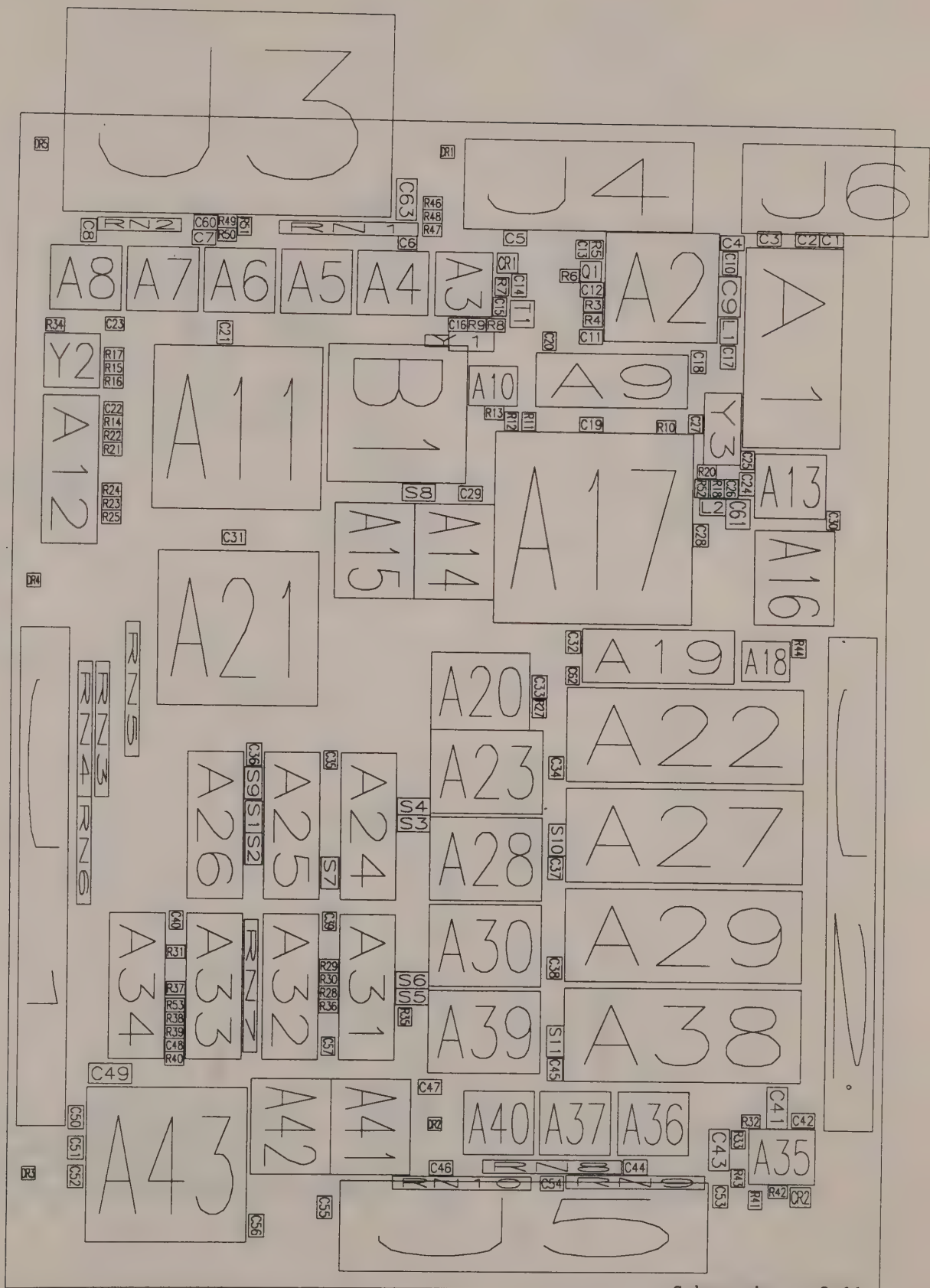
DRAWN KADLUBSKY-B	MODEL : 9300-1 PROCESSOR CARD
CHKD MAVAON-B	DWG NO: 9300-1-S1 REV G
DATE 18-MAR-93	SH 5 OF 7 ECO : 1006


TO 9300-5
FRONT PANEL
TO SMALL
PERIPHERALS
CREDIT CARD
SP(0:37)
CC(0:43)
BA(0:31)
BD(0:15)
BP(0:7)
BC(1:49)
MODEL : 9300-1
PROCESSOR CARD
DWG NO. 9300-1-S1
SH: 6 OF 7
REV : 1006
DRAWN
CHKD
DATE
10-MAR-83
LeCroy CORPORATION


BC(1:49)
BD(0:15)
BA(0:31)
J1
3x32-RA-M-SC
J2
3x32-RA-F-SC
VCC
VEE
+15V
-15V
C51
C52
2xSM.1uF
C49
SM22uF-15V
8xSM.01uFS
15xSM.1uF
TROUS DE MASSE METALISES
LeCroy CORPORATION
MODEL : 9300-1
PROCESSOR CARD
DWG NO: 9300-1-S1
SH 7 OF 7
ECO : 1006
DRAWN
KADLUBSKI-B
CHKD
MAURON-B
DATE
18-MAR-93


9300-1 Rev:E

9300-1 Rev:E


J3
J4
J6
A8
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A3
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Y2
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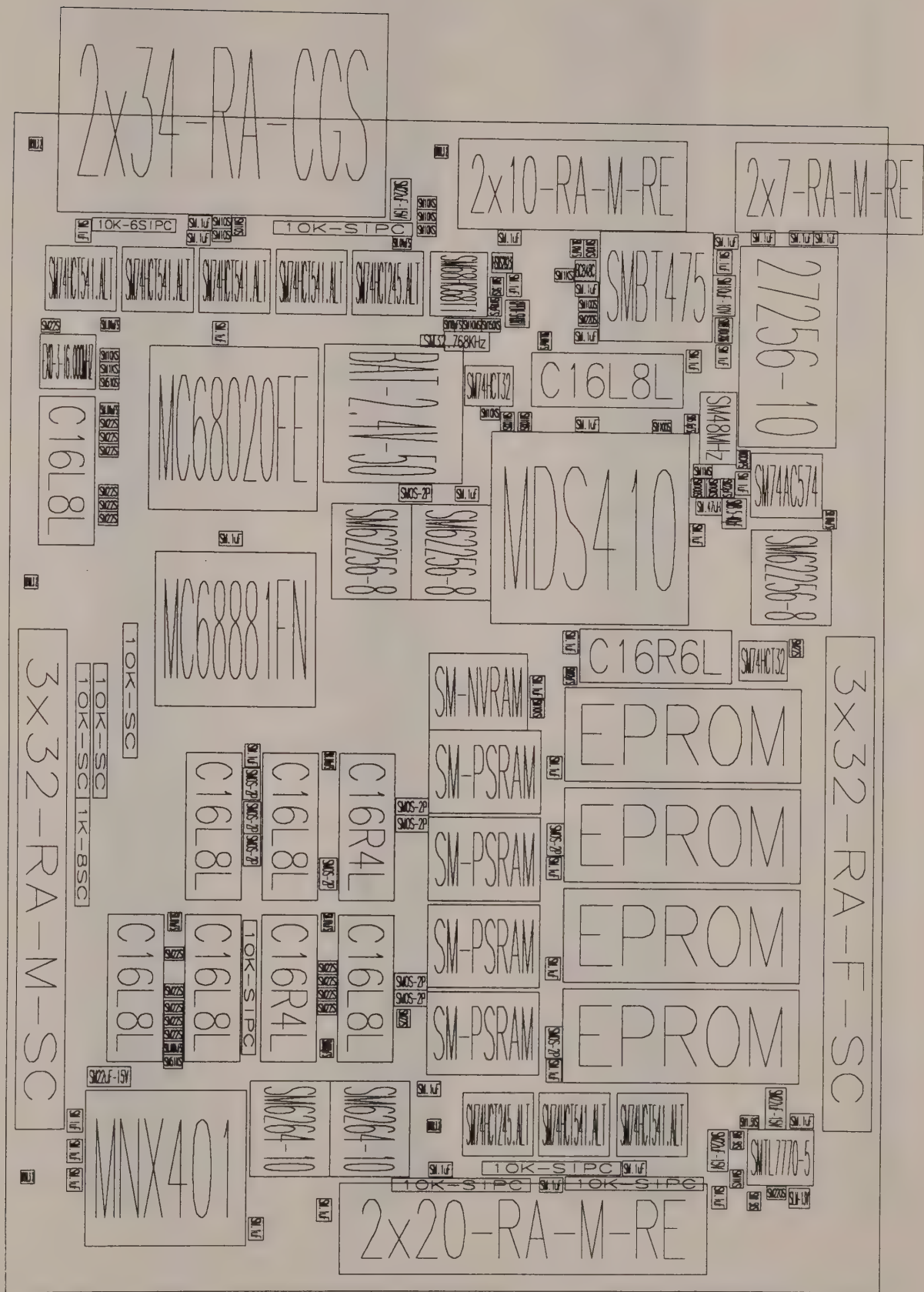
R60
R61
R62
R63
CR1
CR2
DR1
DR2
DR3
DR4
DR5

9300-1 Rev: E
404500068
454511020
205370004
SM207260475
SM207668020
205750000
MDS410
SM207668881
SM-NVRAM
SM-PSRAM
EPROM
455420096
455410096
MNX401
454511040

9300-1 Rev:E


2x34-RA-CGS
2x10-RA-M-RE
2x7-RA-M-RE
10K-6SIPC
10K-SIPC
SM74HCT541.ALT
SM74HCT245.ALT
SMBT475
27256-10
MC68020FE
BAT-2.4V-50
SM32.768KHz
SM74HCT32
C16L8L
SM48MHz
MDS410
SM74AC574
SM62256-8
MC68881FN
C16R6L
3x32-RA-M-SC
3x32-RA-F-SC
10K-SC
1K-8SC
SM-NVRAM
SM-PSRAM
EPROM
C16R4L
SM22uF-15V
MNX401
SM6264-10
SMTL7770-5
2x20-RA-M-RE

A1	205370004	27256-10	DIP28
A2	SM207260475	SMBT475	PLCC_44
A3	SM200276068	SM68HC68T1	SOIC_16L
A4	SM207878245	SM74HCT245.ALT	SOIC_20
A5	SM207178541	SM74HCT541.ALT	SOIC_20
A6	SM207178541	SM74HCT541.ALT	SOIC_20
A7	SM207178541	SM74HCT541.ALT	SOIC_20
A8	SM207178541	SM74HCT541.ALT	SOIC_20
A9	205750000	C16L8L	DIP20
A10	SM200178032	SM74HCT32	SOIC_14
A11	SM207668020	MC68020FE	QUAD_FP_132P
A12	205750000	C16L8L	DIP20
A13	SM201186574	SM74AC574	SOIC_20
A14	SM205219256	SM62256-8	SOIC_28
A15	SM205219256	SM62256-8	SOIC_28
A16	SM205219256	SM62256-8	SOIC_28
A17	MDS410	MDS410	PQFP_120
A18	SM200178032	SM74HCT32	SOIC_14
A19	205750000	C16R6L	DIP20
A20	SM-NVRAM	SM-NVRAM	SOIC_28
A21	SM207668881	MC68881FN	PLCC_68
A22	EPROM	EPROM	DIP32
A23	SM-PSRAM	SM-PSRAM	SOIC_32L
A24	205750000	C16R4L	DIP20
A25	205750000	C16L8L	DIP20
A26	205750000	C16L8L	DIP20
A27	EPROM	EPROM	DIP32
A28	SM-PSRAM	SM-PSRAM	SOIC_32L
A29	EPROM	EPROM	DIP32
A30	SM-PSRAM	SM-PSRAM	SOIC_32L
A31	205750000	C16L8L	DIP20
A32	205750000	C16R4L	DIP20
A33	205750000	C16L8L	DIP20
A34	205750000	C16L8L	DIP20
A35	SM208277770	SMTL7770-5	SOIC_16L
A36	SM207178541	SM74HCT541.ALT	SOIC_20
A37	SM207178541	SM74HCT541.ALT	SOIC_20
A38	EPROM	EPROM	DIP32
A39	SM-PSRAM	SM-PSRAM	SOIC_32L
A40	SM207878245	SM74HCT245.ALT	SOIC_20
A41	SM205219265	SM6264-10	SOIC_28
A42	SM205219265	SM6264-10	SOIC_28
A43	MNX401	MNX401	PLCC_68
B1	312590050	BAT-2.4V-50	BAT_MPF_R
C1	SM661127104	SM.1uF	SM1206
C2	SM661127104	SM.1uF	SM1206
C3	SM661127104	SM.1uF	SM1206
C4	SM661127104	SM.1uF	SM1206
C5	SM661127104	SM.1uF	SM1206
C6	SM661207103	SM.01uFS	SM0805
C7	SM661127104	SM.1uF	SM1206
C8	SM661127104	SM.1uF	SM1206
C9	SM666217106	SM10uF-10V	SMCAPC
C10	SM661127104	SM.1uF	SM1206
C11	SM661127104	SM.1uF	SM1206
C12	SM661127104	SM.1uF	SM1206
C13	SM661207103	SM.01uFS	SM0805
C14	SM661127104	SM.1uF	SM1206
C15	SM661255180	SM18pFS	SM0805
C16	SM661255180	SM18pFS	SM0805
C17	SM661127104	SM.1uF	SM1206
C18	SM661127104	SM.1uF	SM1206
C19	SM661127104	SM.1uF	SM1206
C20	SM661207103	SM.01uFS	SM0805

C21	SM661127104	SM.1uF	SM1206
C22	SM661207103	SM.01uFS	SM0805
C23	SM661207103	SM.01uFS	SM0805
C24	SM661127104	SM.1uF	SM1206
C26	SM661255220	SM22pFS	SM0805
C27	SM661255056	SM5.6pFS	SM0805
C28	SM661127104	SM.1uF	SM1206
C29	SM661127104	SM.1uF	SM1206
C30	SM661207103	SM.01uFS	SM0805
C31	SM661127104	SM.1uF	SM1206
C32	SM661127104	SM.1uF	SM1206
C33	SM661127104	SM.1uF	SM1206
C34	SM661127104	SM.1uF	SM1206
C35	SM661207103	SM.01uFS	SM0805
C36	SM661127104	SM.1uF	SM1206
C37	SM661127104	SM.1uF	SM1206
C38	SM661127104	SM.1uF	SM1206
C39	SM661207103	SM.01uFS	SM0805
C40	SM661207103	SM.01uFS	SM0805
C41	SM666377226	SM22uF-15V	SMCAPETD5
C42	SM661127104	SM.1uF	SM1206
C43	SM666377226	SM22uF-15V	SMCAPETD5
C44	SM661127104	SM.1uF	SM1206
C45	SM661127104	SM.1uF	SM1206
C46	SM661127104	SM.1uF	SM1206
C47	SM661127104	SM.1uF	SM1206
C48	SM661207102	SM.001uFS	SM0805
C49	SM666377226	SM22uF-15V	SMCAPETD5
C50	SM661127104	SM.1uF	SM1206
C51	SM661127104	SM.1uF	SM1206
C52	SM661127104	SM.1uF	SM1206
C53	SM661127104	SM.1uF	SM1206
C54	SM661127104	SM.1uF	SM1206
C55	SM661127104	SM.1uF	SM1206
C56	SM661127104	SM.1uF	SM1206
C57	SM661255101	SM100pFS	SM0805
C60	SM661127104	SM.1uF	SM1206
C61	SM158043040	SM8.5-40pF	SMCAPVAR
C62	SM661255220	SM22pFS	SM0805
C63	SM666377226	SM22uF-15V	SMCAPETD5
CR1	SM253032823	HSMS2823	SOT23
CR2	SM256232013	SLM-13V	SOT23
J1	455410096	3x32-RA-M-SC	CONN3X32_RA_M_SC
J2	455420096	3x32-RA-F-SC	CONN3X32_RA_F_SC
J3	404500068	2x34-RA-CGS	CONN4X17_RA_CGS
J4	454511020	2x10-RA-M-RE	CONN2X10_RA_M_RE
J5	454511040	2x20-RA-M-RE	CONN2X20_RA_M_RE
J6	454511014	2x7-RA-M-RE	CONN2X7_RA_M_RE
L1	SM301502001	SMBEAD1206	SMSELF
L2	SM300546471	SM.47uH	SMSELF
Q1	SM270330848	BC848C	SOT23
R3	SM652101101	SM100S	SM0805
R4	SM652101221	SM220S	SM0805
R5	SM652101103	SM10KS	SM0805
R6	SM652101102	SM1KS	SM0805
R7	SM652101152	SM1.5KS	SM0805
R8	SM652101154	SM150KS	SM0805
R9	SM652101106	SM10MS	SM0805
R10	SM652101101	SM100S	SM0805
R11	SM652101101	SM100S	SM0805
R12	SM652101101	SM100S	SM0805
R13	SM652101103	SM10KS	SM0805
R14	SM652101220	SM22S	SM0805
R15	SM652101102	SM1KS	SM0805

R16	SM652101511	SM510S	SM0805
R17	SM652101103	SM10KS	SM0805
R18	SM652101103	SM10KS	SM0805
R20	SM652101105	SM1MS	SM0805
R21	SM652101220	SM22S	SM0805
R22	SM652101220	SM22S	SM0805
R23	SM652101220	SM22S	SM0805
R24	SM652101220	SM22S	SM0805
R25	SM652101220	SM22S	SM0805
R27	SM652101103	SM10KS	SM0805
R28	SM652101220	SM22S	SM0805
R29	SM652101220	SM22S	SM0805
R30	SM652101220	SM22S	SM0805
R31	SM652101220	SM22S	SM0805
R32	SM652101152	SM1.5KS	SM0805
R33	SM652101152	SM1.5KS	SM0805
R34	SM652101220	SM22S	SM0805
R35	SM652101220	SM22S	SM0805
R36	SM652101220	SM22S	SM0805
R37	SM652101220	SM22S	SM0805
R38	SM652101220	SM22S	SM0805
R39	SM652101220	SM22S	SM0805
R40	SM652101513	SM51KS	SM0805
R41	SM652101152	SM1.5KS	SM0805
R42	SM652101221	SM220S	SM0805
R43	SM652101102	SM1KS	SM0805
R44	SM652101220	SM22S	SM0805
R46	SM652101103	SM10KS	SM0805
R47	SM652101103	SM10KS	SM0805
R48	SM652101103	SM10KS	SM0805
R49	SM652101100	SM10S	SM0805
R50	SM652101100	SM10S	SM0805
R51	SM652101100	SM10S	SM0805
R52	SM652101101	SM100S	SM0805
R53	SM652101220	SM22S	SM0805
RN1	190042103	10K-SIPC	SIP10RES
RN2	190642103	10K-6SIPC	SIP6RES
RN3	190042103	10K-SC	SIP10RES
RN4	190042103	10K-SC	SIP10RES
RN5	190042103	10K-SC	SIP10RES
RN6	190842102	1K-8SC	SIP8RES
RN7	190042103	10K-SIPC	SIP10RES
RN8	190042103	10K-SIPC	SIP10RES
RN9	190042103	10K-SIPC	SIP10RES
RN10	190042103	10K-SIPC	SIP10RES
S1	SM654101000	SM0S-2P	SM0805_2P
S2	SM654101000	SM0S-2P	SM0805_2P
S3	SM654101000	SM0S-2P	SM0805_2P
S4	SM654101000	SM0S-2P	SM0805_2P
S5	SM654101000	SM0S-2P	SM0805_2P
S6	SM654101000	SM0S-2P	SM0805_2P
S7	SM654101000	SM0S-2P	SM0805_2P
S8	SM654101000	SM0S-2P	SM0805_2P
S9	SM654101000	SM0S-2P	SM0805_2P
S10	SM654101000	SM0S-2P	SM0805_2P
S11	SM654101000	SM0S-2P	SM0805_2P
Y1	SM310332768	SM32.768KHz	MC_316
Y2	309380016	EXO-3-16.000MHZ	DIP8
Y3	SM310200048	SM48MHz	MA_416

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: F9300-1
DESC: PROCESSOR CARD WITH 1Mb RAM UOM: EA SC: R REV: G

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
190042103	RESISTOR NETWORK 10 K		3	P	EA	8.00	1.000	00/00/00	99/99/99	
190642103	RESISTOR NETWORK 10 K		4	P	EA	1.00	1.000	00/00/00	99/99/99	
190842102	RES NETWORK 1 K		5	P	EA	1.00	1.000	00/00/00	99/99/99	
205301000	UV E-PROM CMOS 1MBIT		6	P	EA	2.00	1.000	00/00/00	99/99/99	
205370004	IC CMOS UV EPROM 32K X 8 27C		58	P	EA	1.00	1.000	00/00/00	99/99/99	
205370020	IC UV EPROM CMOS 2MBIT		56	P	EA	2.00	1.000	00/00/00	99/99/99	
205750000	IC AND-OR GATE ARRAY 16V8		7	P	EA	9.00	1.000	00/00/00	99/99/99	
309380016	CRYSTAL OSC (PROGR) 16 MHZ		8	P	EA	1.00	1.000	00/00/00	99/99/99	
312590070	BATTERY LITHIUM 3V 70MAH		9	P	EA	1.00	1.000	16/10/92	99/99/99	
400331020	SOCKET IC ST DIP-20		10	P	EA	1.00	1.000	00/00/00	99/99/99	
400360028	SOCKET IC ST DIP-28		62	P	EA	1.00	1.000	22/08/91	99/99/99	
400360032	SOCKET IC ST DIP-32		11	P	EA	4.00	1.000	00/00/00	99/99/99	
404500068	CONN BD TO BD 68 POS		12	P	EA	1.00	1.000	00/00/00	99/99/99	
454511014	HDR SOLD TAIL/MALE/14/RT		52	P	EA	1.00	1.000	00/00/00	99/99/99	
454511020	HDR SOLD TAIL/MALE 20		13	P	EA	1.00	1.000	00/00/00	99/99/99	
454511040	HDR SOLD TAIL/MALE/40/RT		51	P	EA	1.00	1.000	00/00/00	99/99/99	
455410096	CONN RT ANGLE MALE 96 S-CLIP		14	P	EA	1.00	1.000	00/00/00	99/99/99	
455420096	HDR RT ANGLE FEM 96 S-CLIP		15	P	EA	1.00	1.000	00/00/00	99/99/99	
550130108	SCREW CYL HD M3X8		1000	P	EA	2.00	1.000	18/09/91	99/99/99	
552130101	NUT HEX M3		1001	P	EA	2.00	1.000	18/09/91	99/99/99	
719300103	PC BD PREASS'Y 9300-1	E	16	B	EA	1.00	1.000	00/00/00	99/99/99	
MDS410	IC RSDP GATE ARRAY MDS410		1	B	EA	1.00	1.000	00/00/00	99/99/99	
MNX401	ICMIN MAX GATEARR. MNX401		2	B	EA	1.00	1.000	00/00/00	99/99/99	
SM158043040	CAP VARIABLE 8.5 - 40 PF		63	P	EA	1.00	1.000	28/10/91	99/99/99	
SM200178032	IC 2-IN OR HCT32		17	P	EA	2.00	1.000	00/00/00	99/99/99	
SM200276068	IC RTC SERIAL 68HC68T1		54	P	EA	1.00	1.000	00/00/00	99/99/99	
SM201186574	IC OCTAL D-TYP FLOP 74AC574		50	P	EA	1.00	1.000	00/00/00	99/99/99	
SM205219256	IC 32K X 8 SRAM MS62256		47	P	EA	2.00	1.000	00/00/00	99/99/99	
SM205219264	IC 8K X 8 SRAM 70 NSEC 6264		48	P	EA	4.00	1.000	14/02/92	99/99/99	
SM205290512	IC 512K X 8 PSRAM HM658512		45	P	EA	2.00	1.000	00/00/00	99/99/99	
SM207178541	IC BUFFER/LINE DR HCT541		18	P	EA	6.00	1.000	00/00/00	99/99/99	
SM207260475	IC RAMDAC 256W 50MHZ BT475		53	P	EA	1.00	1.000	00/00/00	99/99/99	
SM207668020	IC 32-BIT U-PROC 68020		19	P	EA	1.00	1.000	00/00/00	99/99/99	
SM207668881	IC CO-PROCESSOR 68881		20	P	EA	1.00	1.000	00/00/00	99/99/99	
SM207878245	IC BUS TRANSCVR HCT 245		21	P	EA	2.00	1.000	00/00/00	99/99/99	
SM208277770	IC DUAL PWR SUPPLY SUP 7770-5		55	P	EA	1.00	1.000	00/00/00	99/99/99	
SM236030099	DIODE SO-PKG BAV99		67	P	EA	1.00	1.000	12/01/93	99/99/99	
SM253032823	DIODE SCHOTTKY 2823		22	P	EA	1.00	1.000	00/00/00	99/99/99	
SM256232013	DIODE LIGHT EMITTING RED		23	P	EA	1.00	1.000	00/00/00	99/99/99	
SM270330848	TRANSISTOR NPN BC848C		24	P	EA	1.00	1.000	00/00/00	99/99/99	
SM300546471	INDUCTOR .47UH		64	P	EA	1.00	1.000	28/10/91	99/99/99	
SM301502001	BEAD (FERRITE CHIP)		71	P	EA	1.00	1.000	12/01/93	99/99/99	
SM310200048	CRYSTAL 48 MHZ MA416		46	P	EA	1.00	1.000	00/00/00	99/99/99	
SM310332768	XTAL 32768HZ SMD MC316		57	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101100	RES CHIP (E24) 1% 10 OHMS		66	P	EA	4.00	1.000	09/11/92	99/99/99	
SM652101101	RES CHIP (E24) 1% 100 OHM		26	P	EA	5.00	1.000	28/10/91	99/99/99	
SM652101102	RES CHIP (E24) 1% 1 K		27	P	EA	3.00	1.000	16/10/91	99/99/99	
SM652101103	RES CHIP (E24) 1% 10 K		28	P	EA	9.00	1.000	09/03/93	99/99/99	
SM652101105	RES CHIP (E24) 1% 1 M		29	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101106	RES CHIP (E24) 1% 10 MEG		30	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101152	RES CHIP (E24) 1% 1.5 K		32	P	EA	3.00	1.000	12/01/93	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: F9300-1
DESC: PROCESSOR CARD WITH 1Mb RAM UOM: EA SC: R REV: G

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
SM652101154	RES CHIP (E24) 1% 150 K		33	P	EA	1.00	1.000	15/01/92	99/99/99	
SM652101220	RES CHIP (E24) 1% 22 OHMS		34	P	EA	17.00	1.000	09/11/92	99/99/99	
SM652101221	RES CHIP (E24) 1% 220 OHM		31	P	EA	2.00	1.000	15/01/92	99/99/99	
SM652101332	RES CHIP (E24) 1% 3.3 K		68	P	EA	1.00	1.000	12/01/93	99/99/99	
SM652101511	RES CHIP (E24) 1% 510 OHM		35	P	EA	1.00	1.000	15/01/92	99/99/99	
SM653185152	RES THICK FILM 1.5 K		70	P	EA	1.00	1.000	12/01/93	99/99/99	
SM654101000	CHIP JUMPER ZERO OHMS		37	P	EA	11.00	1.000	16/10/91	99/99/99	
SM661127104	CAP CERA CHIP 20% .1 UF		40	P	EA	37.00	1.000	12/01/93	99/99/99	
SM661207102	CAP CERA CHIP 10% .001UF		38	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661207103	CAP CERA CHIP 20% .01UF		39	P	EA	9.00	1.000	00/00/00	99/99/99	
SM661207104	CAP CERA CHIP 20% .1 UF		69	P	EA	1.00	1.000	12/01/93	99/99/99	
SM661255056	CAP CERA CHIP 5.6 PF		59	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661255101	CAP CERA CHIP 5% 100 PF		60	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661255180	CAP CERA CHIP 5% 18PF		42	P	EA	2.00	1.000	00/00/00	99/99/99	
SM661255220	CAP CERA CHIP 5% 22 PF		61	P	EA	2.00	1.000	26/06/92	99/99/99	
SM666217106	CAP MOLD TANT CHIP 10 UF		43	P	EA	1.00	1.000	00/00/00	99/99/99	
SM666377226	CAP MOLD TANT CHIP 22 UF		44	P	EA	4.00	1.000	26/06/92	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: F9314M-1
DESC: PROCESSOR CARD WITH 2Mb RAM UOM: EA SC: R REV: G

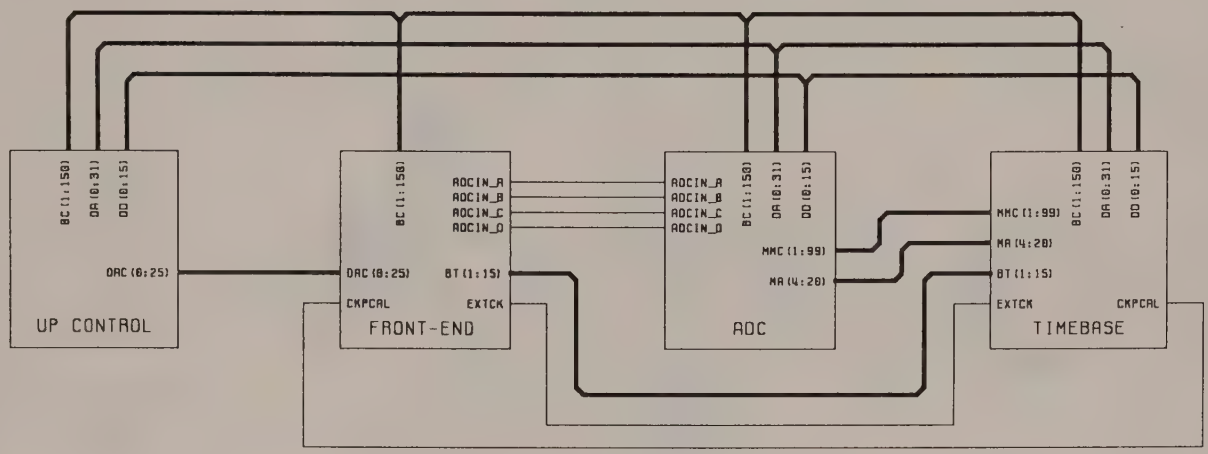
COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
190042103	RESISTOR NETWORK 10 K		3	P	EA	8.00	1.000	00/00/00	99/99/99	
190642103	RESISTOR NETWORK 10 K		4	P	EA	1.00	1.000	00/00/00	99/99/99	
190842102	RES NETWORK 1 K		5	P	EA	1.00	1.000	00/00/00	99/99/99	
205301000	UV E-PROM CMOS 1MBIT		6	P	EA	2.00	1.000	00/00/00	99/99/99	
205370004	IC CMOS UV EPROM 32K X 8 27C		58	P	EA	1.00	1.000	00/00/00	99/99/99	
205370020	IC UV EPROM CMOS 2MBIT		56	P	EA	2.00	1.000	00/00/00	99/99/99	
205750000	IC AND-OR GATE ARRAY 16V8		7	P	EA	9.00	1.000	00/00/00	99/99/99	
309380016	CRYSTAL OSC (PROGR) 16 MHZ		8	P	EA	1.00	1.000	00/00/00	99/99/99	
312590070	BATTERY LITHIUM 3V 70MAH		9	P	EA	1.00	1.000	16/10/92	99/99/99	
400331020	SOCKET IC ST DIP-20		10	P	EA	1.00	1.000	00/00/00	99/99/99	
400360028	SOCKET IC ST DIP-28		62	P	EA	1.00	1.000	22/08/91	99/99/99	
400360032	SOCKET IC ST DIP-32		11	P	EA	4.00	1.000	00/00/00	99/99/99	
404500068	CONN BD TO BD 68 POS		12	P	EA	1.00	1.000	00/00/00	99/99/99	
454511014	HDR SOLD TAIL/MALE/14/RT		52	P	EA	1.00	1.000	00/00/00	99/99/99	
454511020	HDR SOLD TAIL/MALE 20		13	P	EA	1.00	1.000	00/00/00	99/99/99	
454511040	HDR SOLD TAIL/MALE/40/RT		51	P	EA	1.00	1.000	00/00/00	99/99/99	
455410096	CONN RT ANGLE MALE 96 S-CLIP		14	P	EA	1.00	1.000	00/00/00	99/99/99	
455420096	HDR RT ANGLE FEM 96 S-CLIP		15	P	EA	1.00	1.000	00/00/00	99/99/99	
550130108	SCREW CYL HD M3X8		1000	P	EA	2.00	1.000	18/09/91	99/99/99	
552130101	NUT HEX M3		1001	P	EA	2.00	1.000	18/09/91	99/99/99	
719300103	PC BD PREASS'Y 9300-1	E	16	B	EA	1.00	1.000	00/00/00	99/99/99	
MDS410	IC RSDP GATE ARRAY MDS410		1	B	EA	1.00	1.000	00/00/00	99/99/99	
MNX401	ICMIN MAX GATEARR. MNX401		2	B	EA	1.00	1.000	00/00/00	99/99/99	
SM158043040	CAP VARIABLE 8.5 - 40 PF		63	P	EA	1.00	1.000	28/10/91	99/99/99	
SM200178032	IC 2-IN OR HCT32		17	P	EA	2.00	1.000	00/00/00	99/99/99	
SM200276068	IC RTC SERIAL 68HC68T1		54	P	EA	1.00	1.000	00/00/00	99/99/99	
SM201186574	IC OCTAL D-TYP FLOP 74AC574		50	P	EA	1.00	1.000	00/00/00	99/99/99	
SM205219256	IC 32K X 8 SRAM MS62256		47	P	EA	2.00	1.000	00/00/00	99/99/99	
SM205219264	IC 8K X 8 SRAM 70 NSEC 6264		48	P	EA	4.00	1.000	14/02/92	99/99/99	
SM205290512	IC 512K X 8 PSRAM HM658512		45	P	EA	4.00	1.000	00/00/00	99/99/99	
SM207178541	IC BUFFER/LINE DR HCT541		18	P	EA	6.00	1.000	00/00/00	99/99/99	
SM207260475	IC RAMDAC 256W 50MHZ BT475		53	P	EA	1.00	1.000	00/00/00	99/99/99	
SM207668020	IC 32-BIT U-PROC 68020		19	P	EA	1.00	1.000	00/00/00	99/99/99	
SM207668881	IC CO-PROCESSOR 68881		20	P	EA	1.00	1.000	00/00/00	99/99/99	
SM207878245	IC BUS TRANSCVR HCT 245		21	P	EA	2.00	1.000	00/00/00	99/99/99	
SM208277770	IC DUAL PWR SUPPLY SUP 7770-5		55	P	EA	1.00	1.000	00/00/00	99/99/99	
SM236030099	DIODE SO-PKG BAV99		67	P	EA	1.00	1.000	12/01/93	99/99/99	
SM253032823	DIODE SCHOTTKY 2823		22	P	EA	1.00	1.000	00/00/00	99/99/99	
SM256232013	DIODE LIGHT EMITTING RED		23	P	EA	1.00	1.000	00/00/00	99/99/99	
SM270330848	TRANSISTOR NPN BC848C		24	P	EA	1.00	1.000	00/00/00	99/99/99	
SM300546471	INDUCTOR .47UH		64	P	EA	1.00	1.000	28/10/91	99/99/99	
SM301502001	BEAD (FERRITE CHIP)		71	P	EA	1.00	1.000	12/01/93	99/99/99	
SM310200048	CRYSTAL 48 MHZ MA416		46	P	EA	1.00	1.000	00/00/00	99/99/99	
SM310332768	XTAL 32768HZ SMD MC316		57	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101100	RES CHIP (E24) 1% 10 OHMS		66	P	EA	4.00	1.000	09/11/92	99/99/99	
SM652101101	RES CHIP (E24) 1% 100 OHM		26	P	EA	5.00	1.000	28/10/91	99/99/99	
SM652101102	RES CHIP (E24) 1% 1 K		27	P	EA	3.00	1.000	16/10/91	99/99/99	
SM652101103	RES CHIP (E24) 1% 10 K		28	P	EA	9.00	1.000	09/03/93	99/99/99	
SM652101105	RES CHIP (E24) 1% 1 M		29	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101106	RES CHIP (E24) 1% 10 MEG		30	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101152	RES CHIP (E24) 1% 1.5 K		32	P	EA	3.00	1.000	12/01/93	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: F9314M-1
DESC: PROCESSOR CARD WITH 2Mb RAM UOM: EA SC: R REV: G

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
SM652101154	RES CHIP (E24) 1% 150 K		33	P	EA	1.00	1.000	15/01/92	99/99/99	
SM652101220	RES CHIP (E24) 1% 22 OHMS		34	P	EA	17.00	1.000	09/11/92	99/99/99	
SM652101221	RES CHIP (E24) 1% 220 OHM		31	P	EA	2.00	1.000	15/01/92	99/99/99	
SM652101332	RES CHIP (E24) 1% 3.3 K		68	P	EA	1.00	1.000	12/01/93	99/99/99	
SM652101511	RES CHIP (E24) 1% 510 OHM		35	P	EA	1.00	1.000	15/01/92	99/99/99	
SM653185152	RES THICK FILM 1.5 K		70	P	EA	1.00	1.000	12/01/93	99/99/99	
SM654101000	CHIP JUMPER ZERO OHMS		37	P	EA	11.00	1.000	16/10/91	99/99/99	
SM661127104	CAP CERA CHIP 20% .1 UF		40	P	EA	37.00	1.000	12/01/93	99/99/99	
SM661207102	CAP CERA CHIP 10% .001UF		38	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661207103	CAP CERA CHIP 20% .01UF		39	P	EA	9.00	1.000	00/00/00	99/99/99	
SM661207104	CAP CERA CHIP 20% .1 UF		69	P	EA	1.00	1.000	12/01/93	99/99/99	
SM661255056	CAP CERA CHIP 5.6 PF		59	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661255101	CAP CERA CHIP 5% 100 PF		60	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661255180	CAP CERA CHIP 5% 18PF		42	P	EA	2.00	1.000	00/00/00	99/99/99	
SM661255220	CAP CERA CHIP 5% 22 PF		61	P	EA	2.00	1.000	26/06/92	99/99/99	
SM666217106	CAP MOLD TANT CHIP 10 UF		43	P	EA	1.00	1.000	00/00/00	99/99/99	
SM666377226	CAP MOLD TANT CHIP 22 UF		44	P	EA	4.00	1.000	26/06/92	99/99/99	



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LeCroy CORPORATION

DRAWN: KADLUBSKI-B	MODEL : 931x-3 MAIN CARD
CHKD: MAUROW-B	DWG NO: 931x-3-S1 REV: 0
DATE: 9-DEC-92	SH 1 OF 2 ECO : 1024

	9310	9310M	9310L	9314	9314M	9314L
ADC MEMORY :	16x 2Kx8	16x 8Kx8	16x 128Kx8	32x 2Kx8	32x 8Kx8	32x 128Kx8

COMPONENT NO MOUNTED :	9310	9310M	9310L	9314
FE / ADC CHANNELS :	A & B			none
PSRAM 128Kx8 (ADC SHEET1)	A206-A216 A203-A211	A206-A216		A206-A216 A203-A211
MIN-MAX MNX401 (ADC SHEET1)	A224			A224
ADDRESS COUNTER SM74HCT191 (ADC SHEET3)	A205-A207 A212-A217	none		A205-A207 A212-A217
GAL 16V8A - "CORNAC" (uP SHEET2)	A10	none		A10
SM74HCT541+SM74HCT245 (ADC SHEET3)	A222-A204-A218			
SMLF347 (FE SHEET1)	A101			
SMDG201 (FE SHEET1)	A102			
SM.01uF-NPO (FE SHEET1)	C100-C101-C104-C105			
SM10KS (FE SHEET1)	R100-R101-R102-R103			
SM.01uFS (FE SHEET2)	C102-C103-C106-C107			
SM.01uFS (ADC SHEET4)	C207-C225-C452			
220-6SIPC (TB SHEET2)	RN400			
SM68S (TB SHEET2)	R532-R542-R572-R573			
SM20S (TB SHEET2)	R569-R571-R602-R603			

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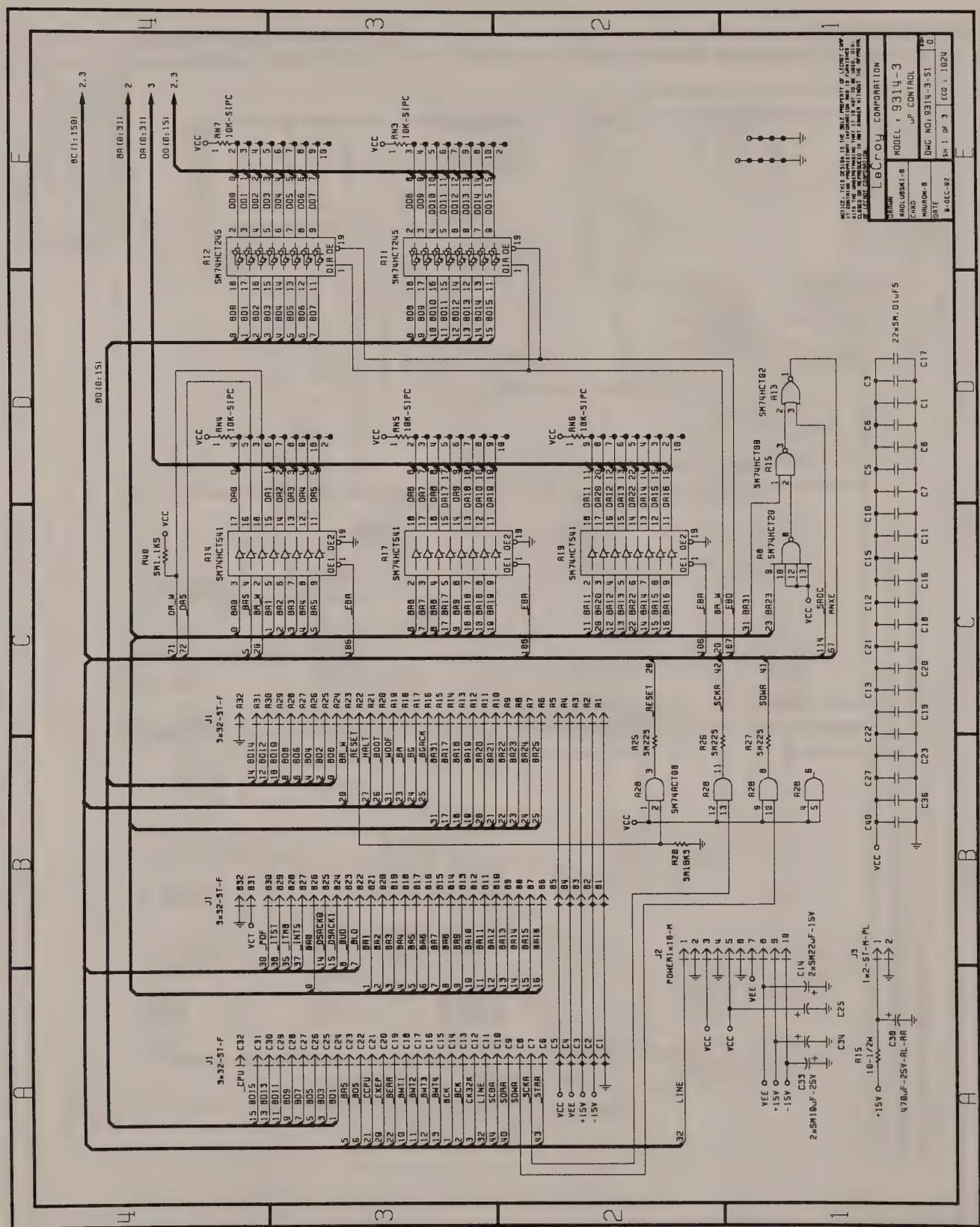
LeCroy CORPORATION

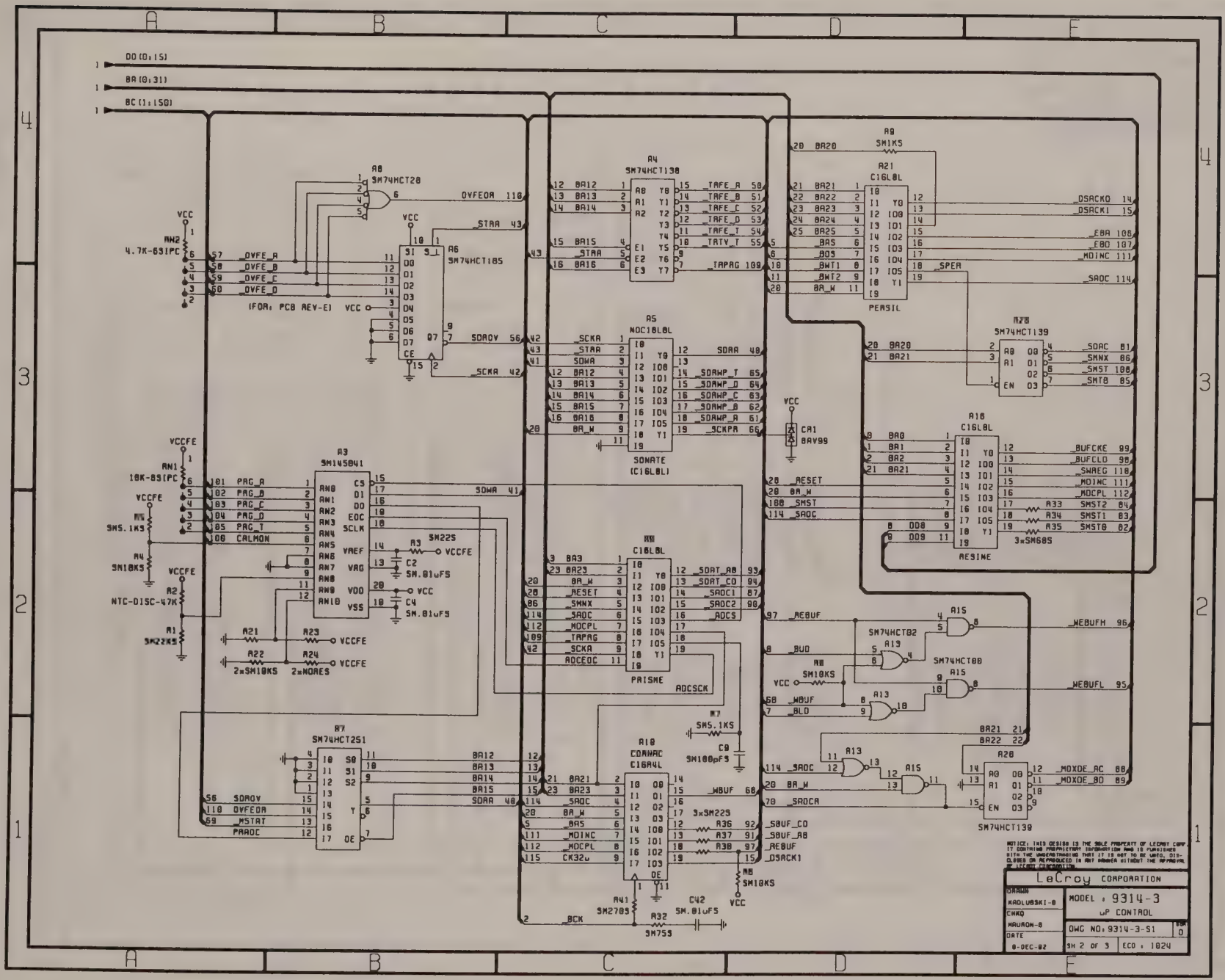
DRAWN	MODEL : 931x-3 MAIN CARD
KADLUBSKI-B	
CHKD	
MAURON-B	DWG NO: 931x-3-S1 REV 0
DATE	
9-DEC-92	SH 2 OF 2 ECO : 1024

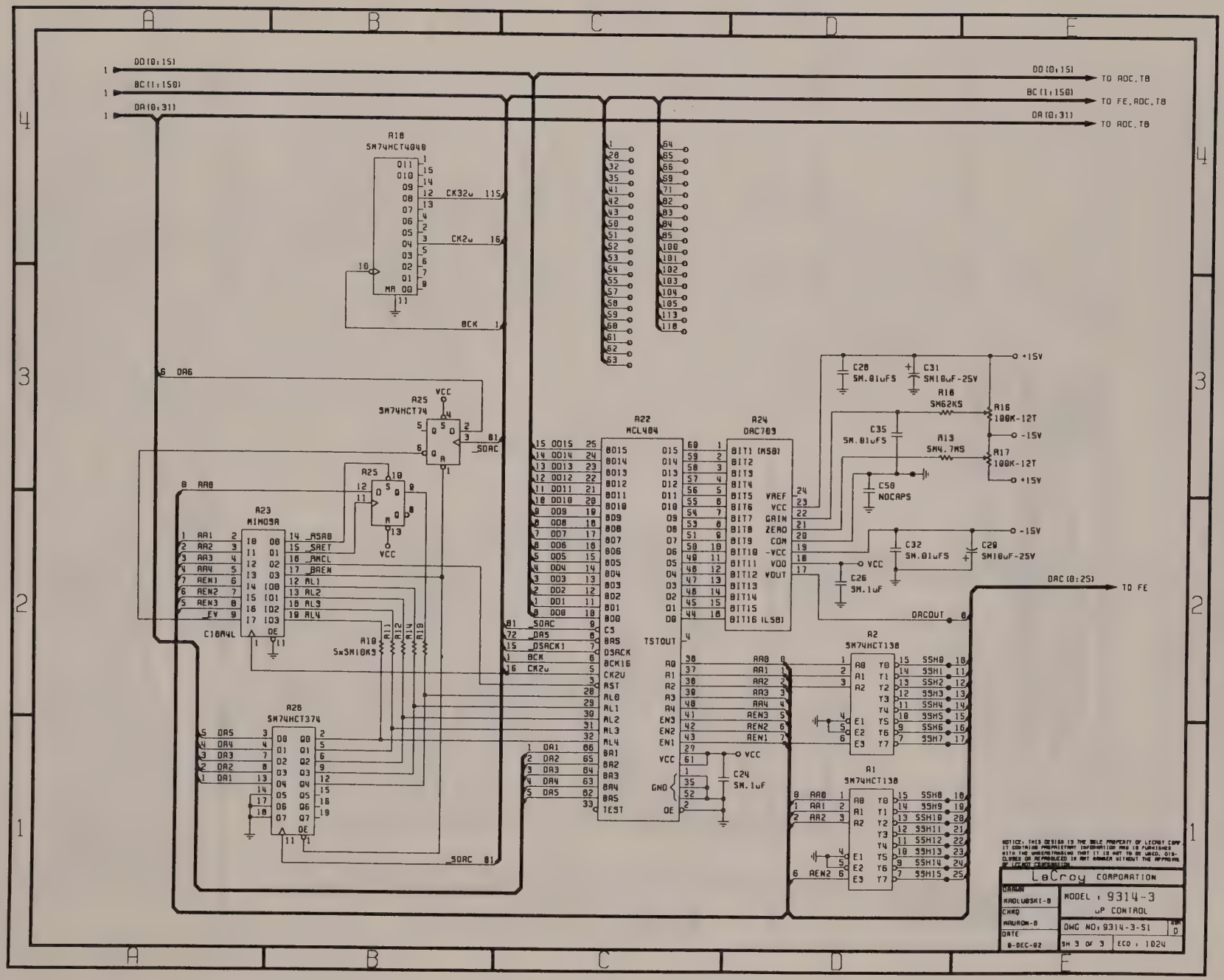
OVERVIEW
9310-3 Rev:G

9310-3 Rev:G

OVERVIEW


LeCroy CORPORATION
MODEL : 9314-3
uP CONTROL
DWG NO: 9314-3-S1
SH 1 OF 3
ECO : 1024
DRAWN KROLUBSKI-B
CHKD MAUROW-B
DATE 9-DEC-92


DO (0:15)
BA (0:31)
BC (1:15Q)
A8 SM74HCT28
OVFEOA 110
STAA 43
VCC
AN2 4.7K-8SIPC
_OVFE_A 57
_OVFE_B 58
_OVFE_C 59
_OVFE_D 60
(FOR: PCB REV-E) VCC
A6 SM74HCT185
SDAOV 56
SCKA 42
A4 SM74HCT138
_TAFE_A 50
_TAFE_B 51
_TAFE_C 52
_TAFE_D 53
_TAFE_T 54
_TATV_T 55
_TAPAG 109
A9 SM1K5
A21 C16L8L
_DSACK0 14
_DSACK1 15
_EBA 106
_EBO 107
_MDINC 111
_SAOC 114
_SPER
PEASIL
A20 SM74HCT139
_SAOC 81
_SMNX 86
_SMST 108
_SMT8 85
A5 NOC18L8L
SDAA 48
_SCKA 1
_STAA 2
SDWA 3
_SDAWP_T 65
_SDAWP_D 64
_SDAWP_C 63
_SDAWP_B 62
_SDAWP_A 61
_SCKPA 66
SDWATE (C16L8L)
CA1 BAV99
A18 C16L8L
_BUFCKE 99
_BUFCLO 98
_SWAEG 116
_MDINC 111
_MDCPL 112
SMST2 84
SMST1 83
SMST0 82
3×SM68S
AESINE
_RESET 28
_SMST 100
_SAOC 114
VCCFE
AN1 10K-8SIPC
SM5.1K3
R4 SM10K3
R2 NTC-DISC-47K
R1 SM22K5
A3 SM1458Q1
_PAG_A 101
_PAG_B 82
_PAG_C 83
_PAG_D 84
_PAG_T 85
_CALMON 86
SDWA 41
A3 SM22S
C2 SM.01uFS
C4 SM.01uFS
A21 A23 A22 A24
2×SM10KS 2×MORES
A8 C16L8L
_SDAT_A8 93
_SDAT_C0 94
_SAOC1 87
_SAOC2 88
_ADCS 89
_MDCPL 7
_TAPAG 8
_SCKA 9
ADCEOC 11
PAISME
ADCSCK
_AEBUF 97
_BUD 8
_WBUF 58
_BLD 7
A15 SM74HCT82
A13 SM74HCT08
A15
WEBUFH 96
WEBUFL 95
A13
A15
A28 SM74HCT139
_MOXDE_AC 88
_MOXDE_BD 89
_SAOCA 70
A7 SM74HCT251
SDAOV 56
OVFEOA 110
_MSTAT 69
PAAOC
BA12 12
BA13 13
BA14 14
BA15 15
SDAA 48
A10 COMMAC C16A4L
_SBUF_C0 92
_SBUF_A8 91
_AEBUF 97
_DSACK1 15
A7 SM5.1K5
C9 SM100pF5
A5 SM10K5
A41 SM270S
C42 SM.01uFS
A32 SM75S
_BCK 2
LeCroy CORPORATION
DRAWN KADLUBSKI-B
CHKD MARANON-B
DATE 8-DEC-82
MODEL : 9314-3
uP CONTROL
DWG NO: 9314-3-S1
REV 0
SH 2 OF 3
ECO : 1024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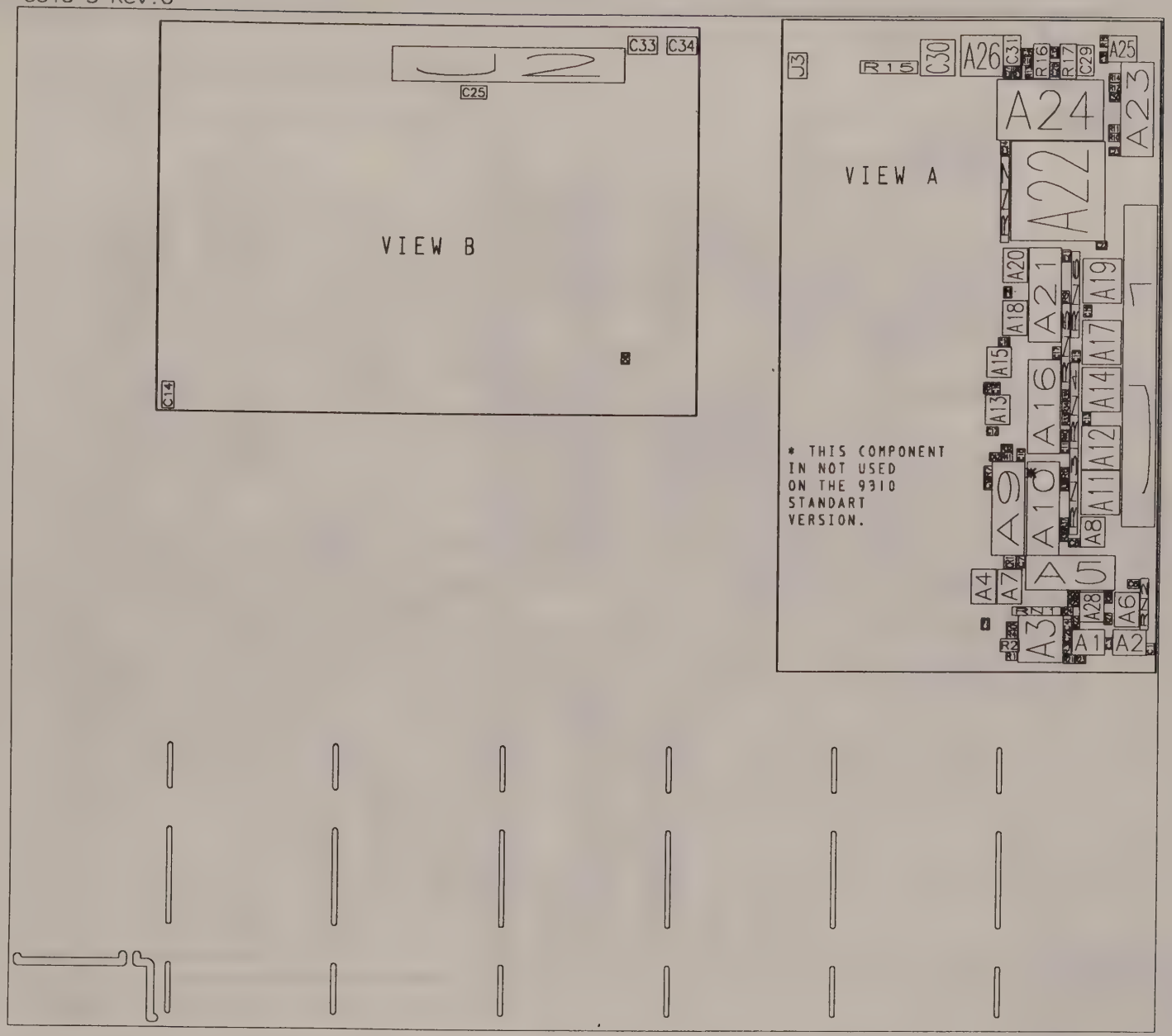
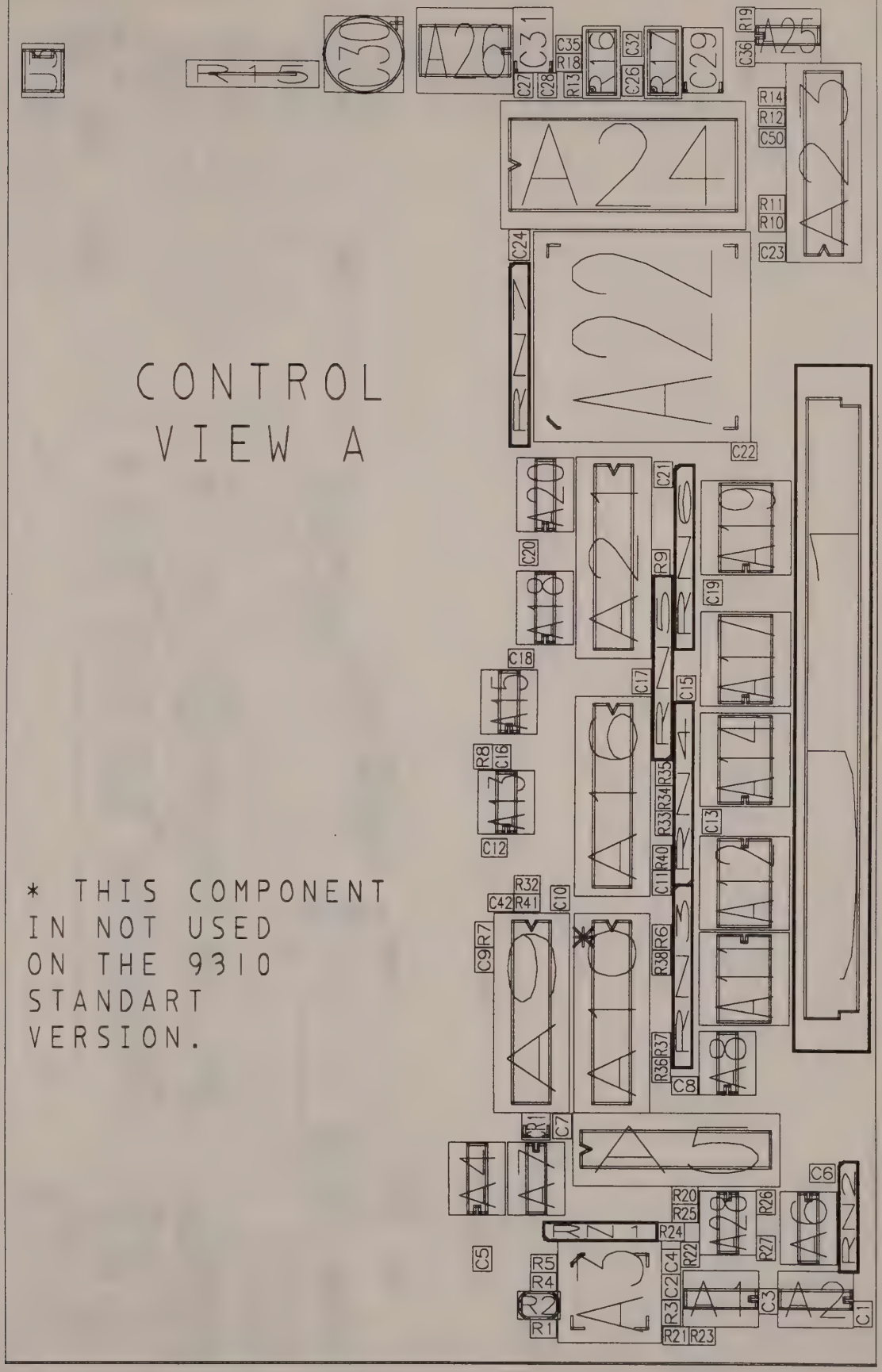
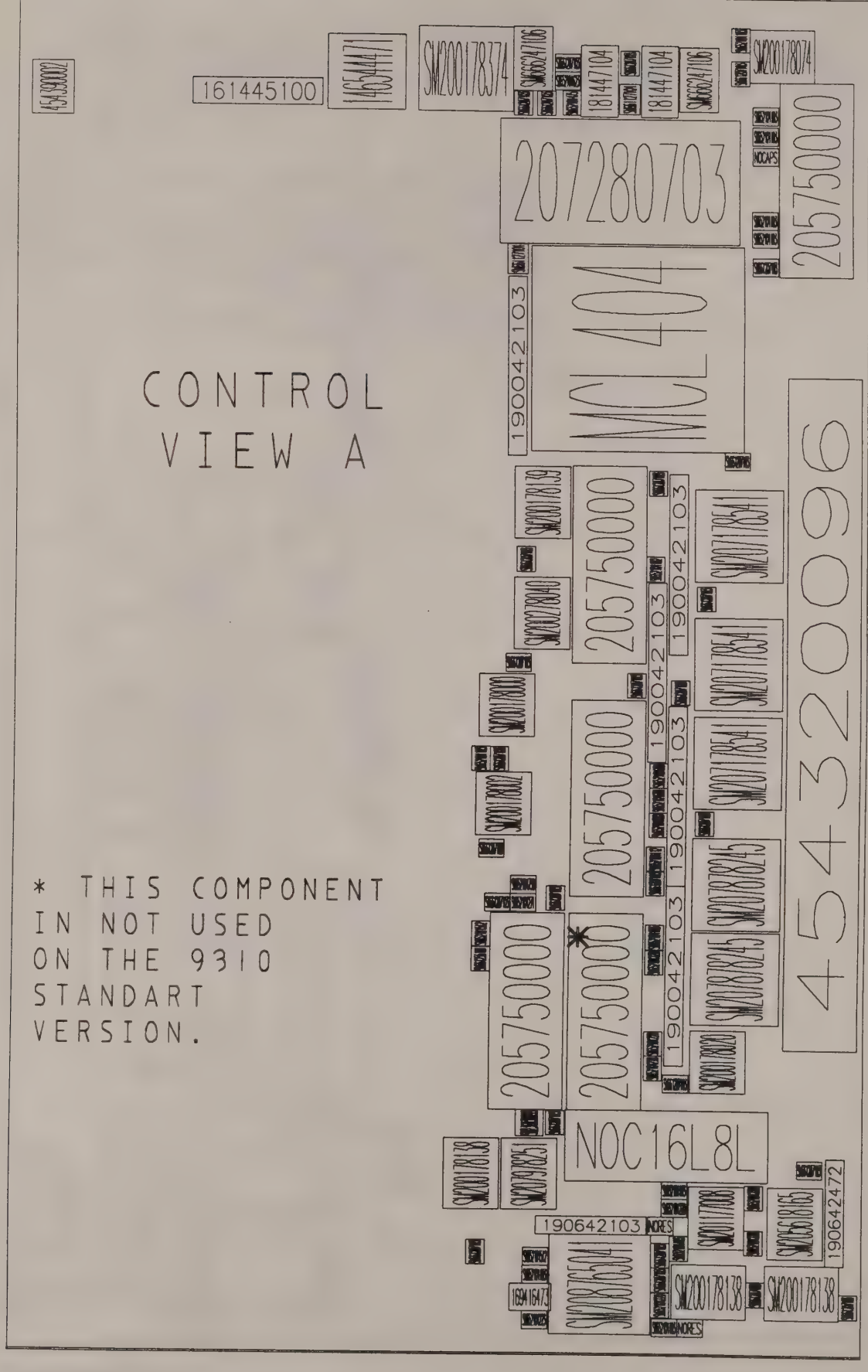
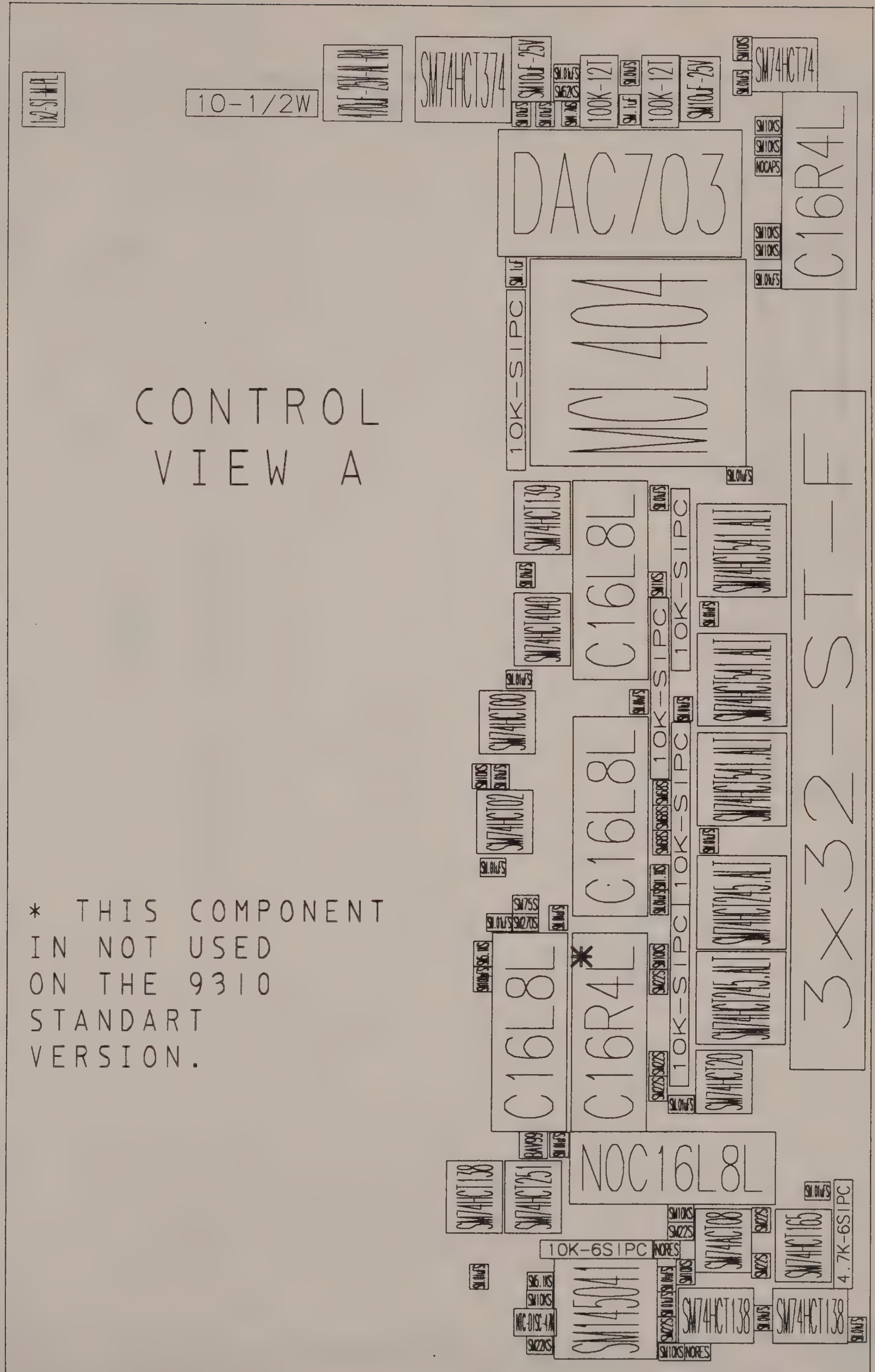
BC(1:150)
DA(0:31)
TO ADC,T8
TO FE,ADC,T8
A18
SM74HCT4040
CK32u
CK2u
BCK
A25
SM74HCT74
VCC
SDAC
DA6
AA8
A23
MM09A
_ASAB
_SAET
_AMCL
_AAEN
AL1
AL2
AL3
AL4
AEN1
AEN2
AEN3
_EV
C18A4L
A18
5xSM10K3
A26
SM74HCT374
A22
MCL484
TSTOUT
_SDAC
_DA5
_DSACK1
BCK
CK2u
AST
A24
DAC703
BIT1 (MSB)
VREF
VCC
GAIN
ZERO
COM
-VCC
VOUT
C28
SM.01uFS
C31
SM10uF-25V
R18
5M62KS
R16
100K-12T
C35
SM.01uFS
R13
5M4.7KS
R17
100K-12T
C58
NOCAPS
C32
SM.01uFS
C29
SM10uF-25V
C26
SM.1uF
+15V
-15V
VCC
DAC(0:25)
TO FE
DACOUT
C24
SM.1uF
A2
SM74HCT138
A1
SM74HCT138
SSH0
SSH1
SSH2
SSH3
SSH4
SSH5
SSH6
SSH7
SSH8
SSH9
SSH10
SSH11
SSH12
SSH13
SSH14
SSH15
LeCroy CORPORATION
MODEL : 9314-3
uP CONTROL
DWG NO: 9314-3-S1
SH 3 OF 3
ECO : 1024
DRAWN
KADLUBSKI-B
CHKD
MAURON-B
DATE
8-DEC-92

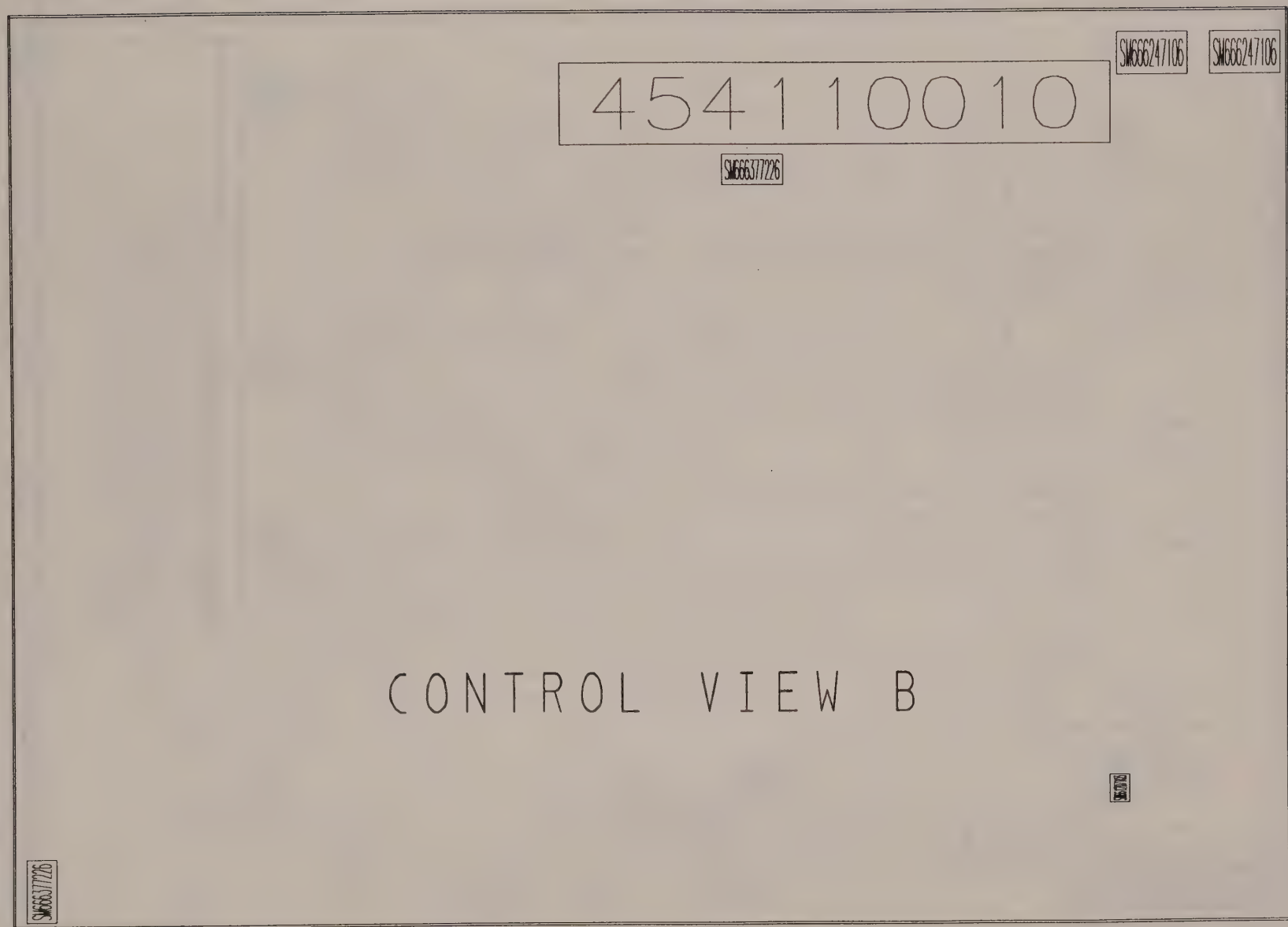

9310-3 Rev:G
J2
C33
C34
C25
C14
VIEW B
J3
R15
C30
A26
C31
R16
R17
C29
A25
A24
A23
A22
VIEW A
A20
A21
A19
A18
A17
A15
A16
A14
A13
A12
A11
A10
A9
A8
A7
A5
A4
A28
A6
A3
A1
A2
* THIS COMPONENT
IN NOT USED
ON THE 9310
STANDART
VERSION.
MICROPROCESSOR CONTROL

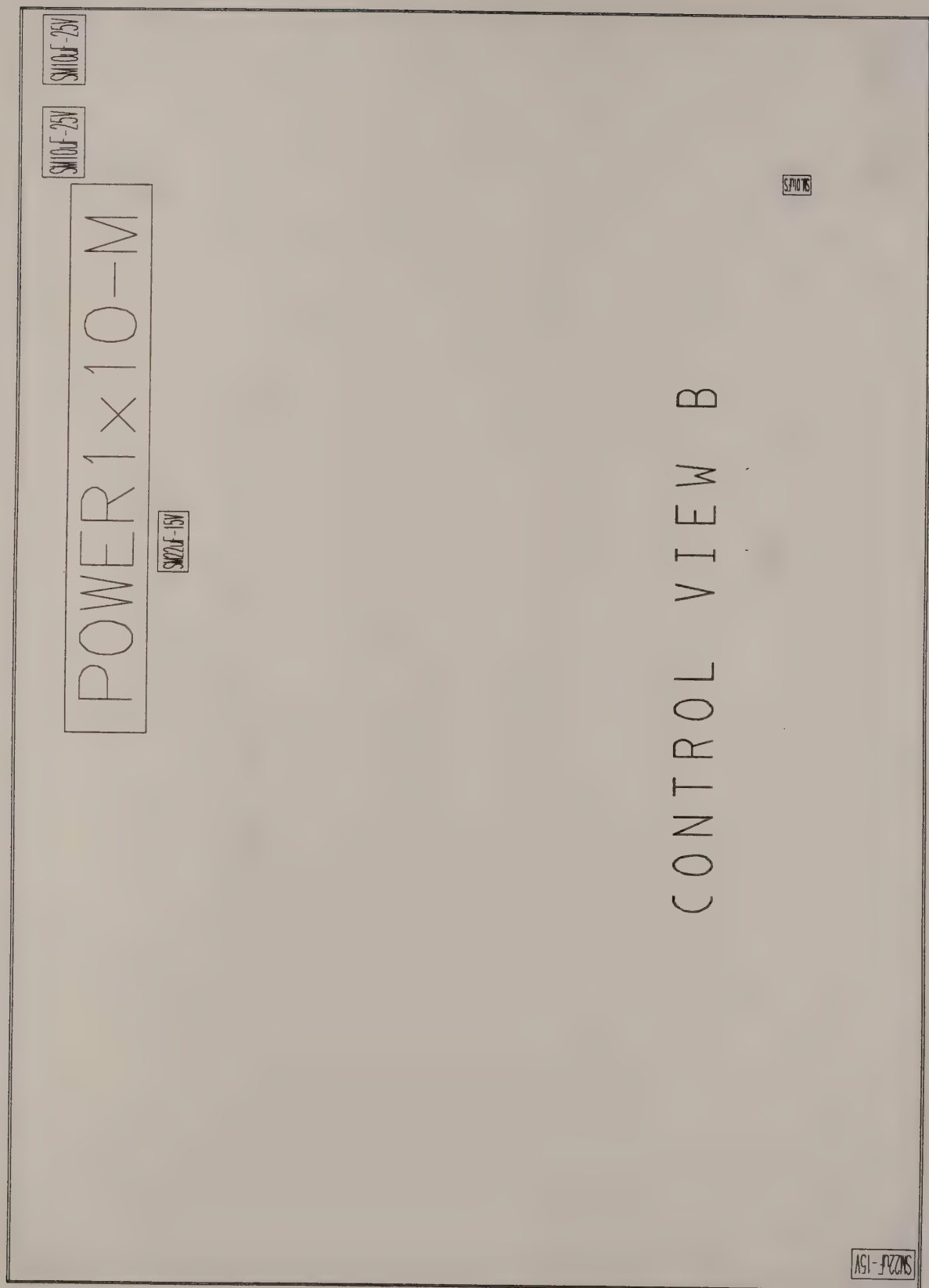

CONTROL
VIEW A
* THIS COMPONENT
IN NOT USED
ON THE 9310
STANDART
VERSION.

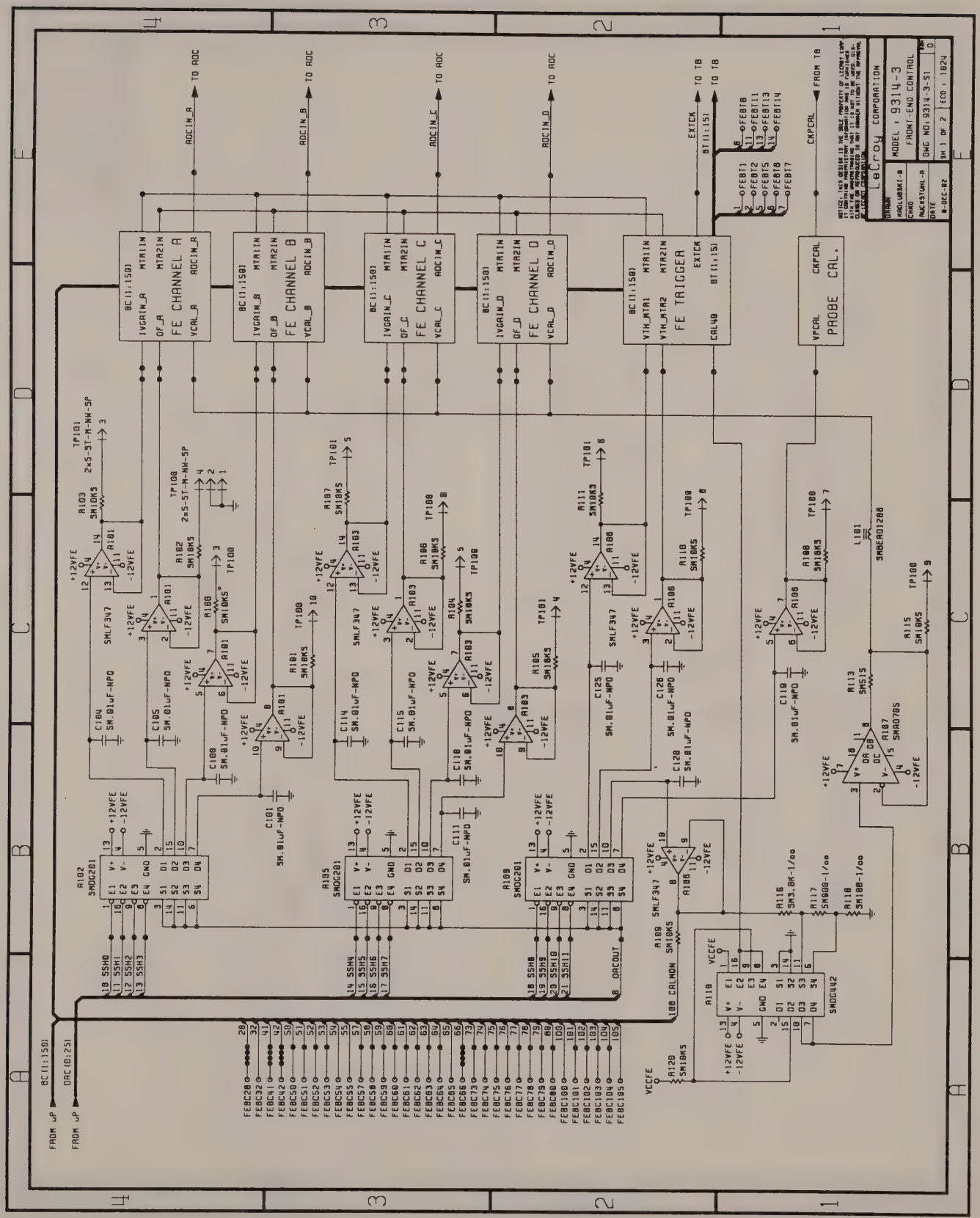

CONTROL
VIEW A
* THIS COMPONENT
IN NOT USED
ON THE 9310
STANDART
VERSION.
161445100
207280703
205750000
MCL404
190042103
454320096
NOC16L8L
190642103
190642472
SM200178138
SM200178374
SM200178074
NOCAPS
NORES

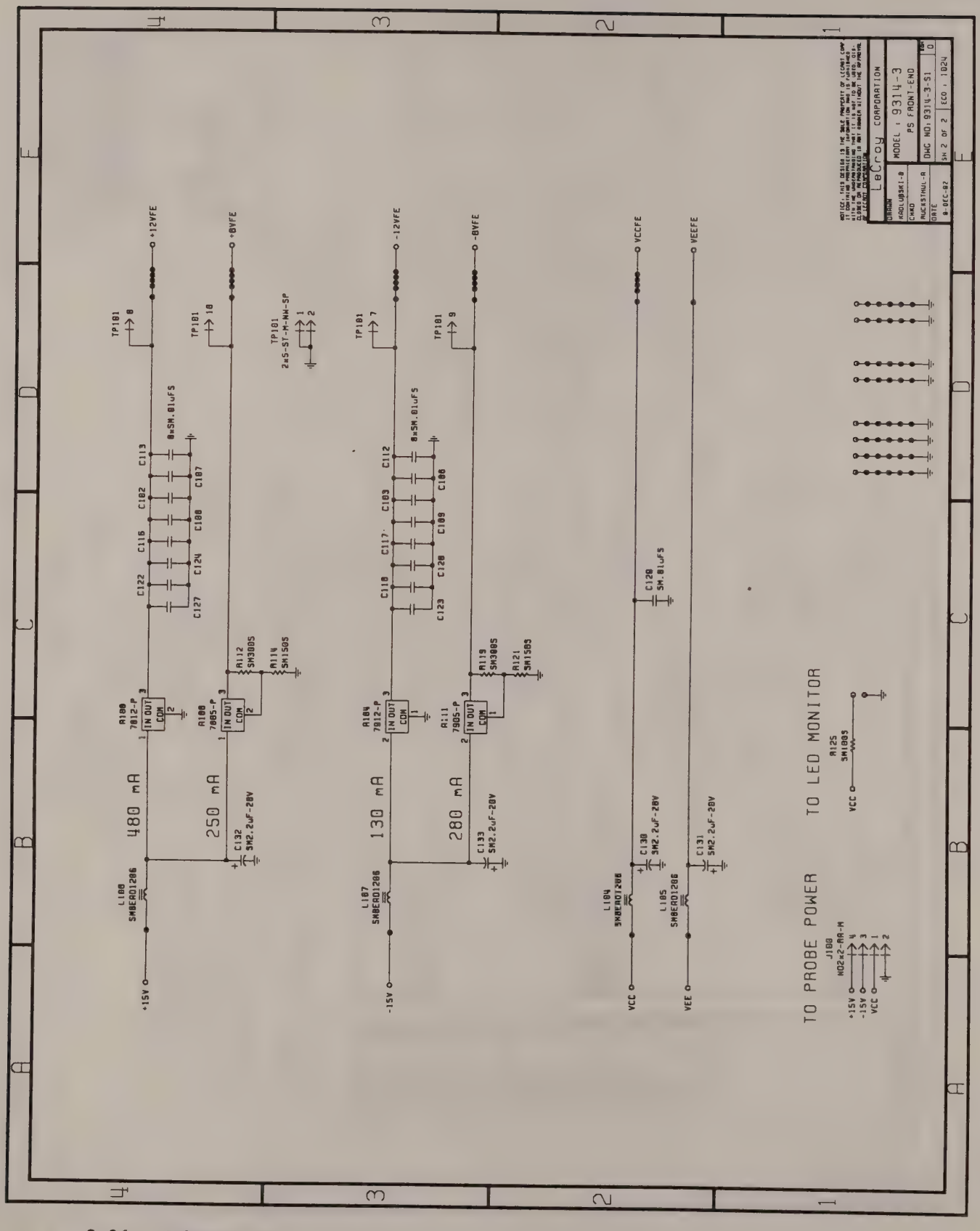

CONTROL
VIEW A
10-1/2W
SM74HCT374
100K-12T
SM74HCT74
DAC703
C16R4L
MCL404
10K-SIPC
3X32-ST-F
C16L8L
SM74HCT139
SM74HCT4040
SM74HCT00
SM74HCT02
C16L8L
C16R4L
NOC16L8L
SM74HCT138
SM74HCT251
SM74HCT20
SM74ACT08
SM74HCT165
10K-6SIPC
4.7K-6SIPC
SM74HCT138
SM74HCT138
BAV99
NORES
NOCAPS
* THIS COMPONENT
IN NOT USED
ON THE 9310
STANDART
VERSION.

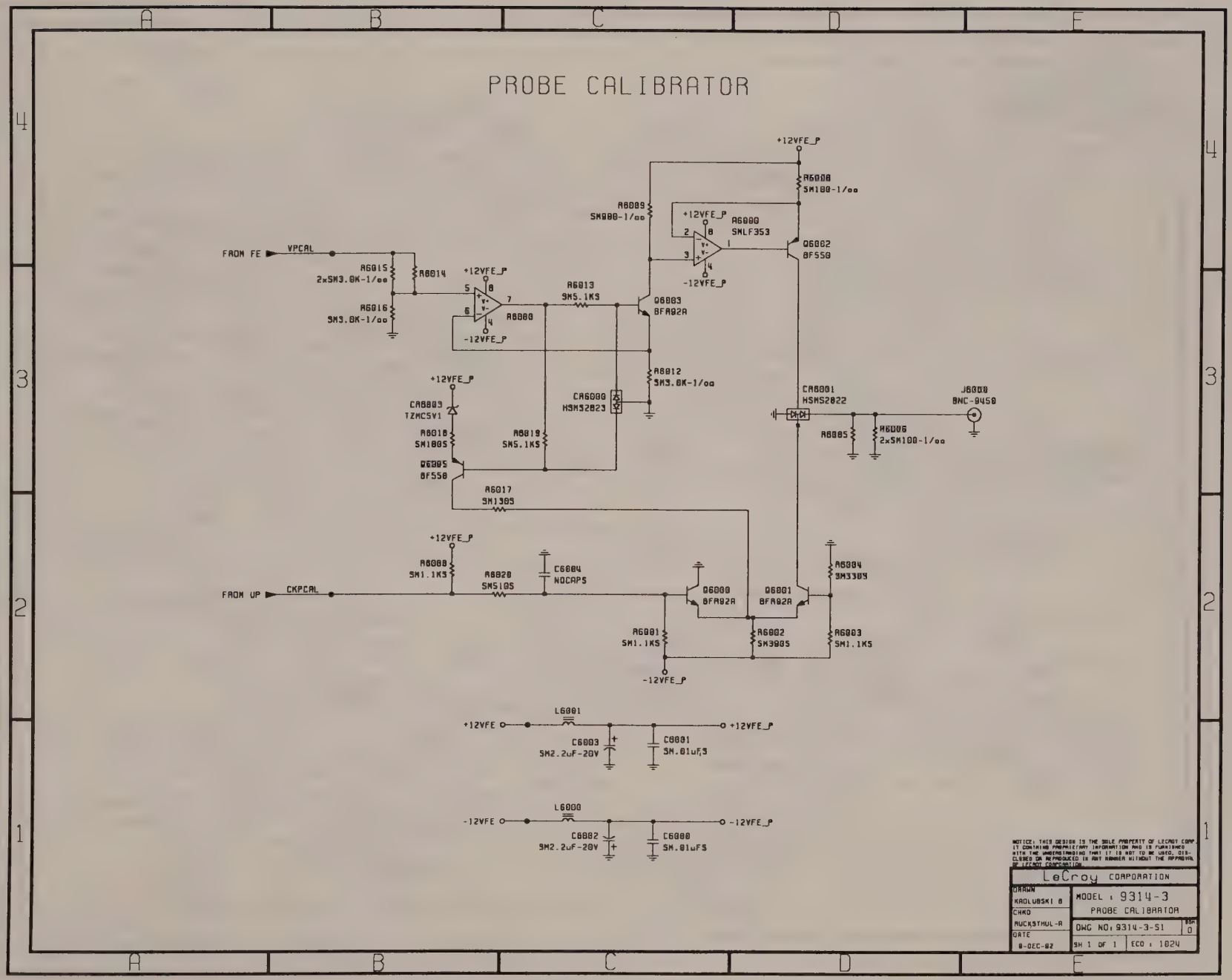
C34
C33
C25
C40
CONTROL VIEW B
C14

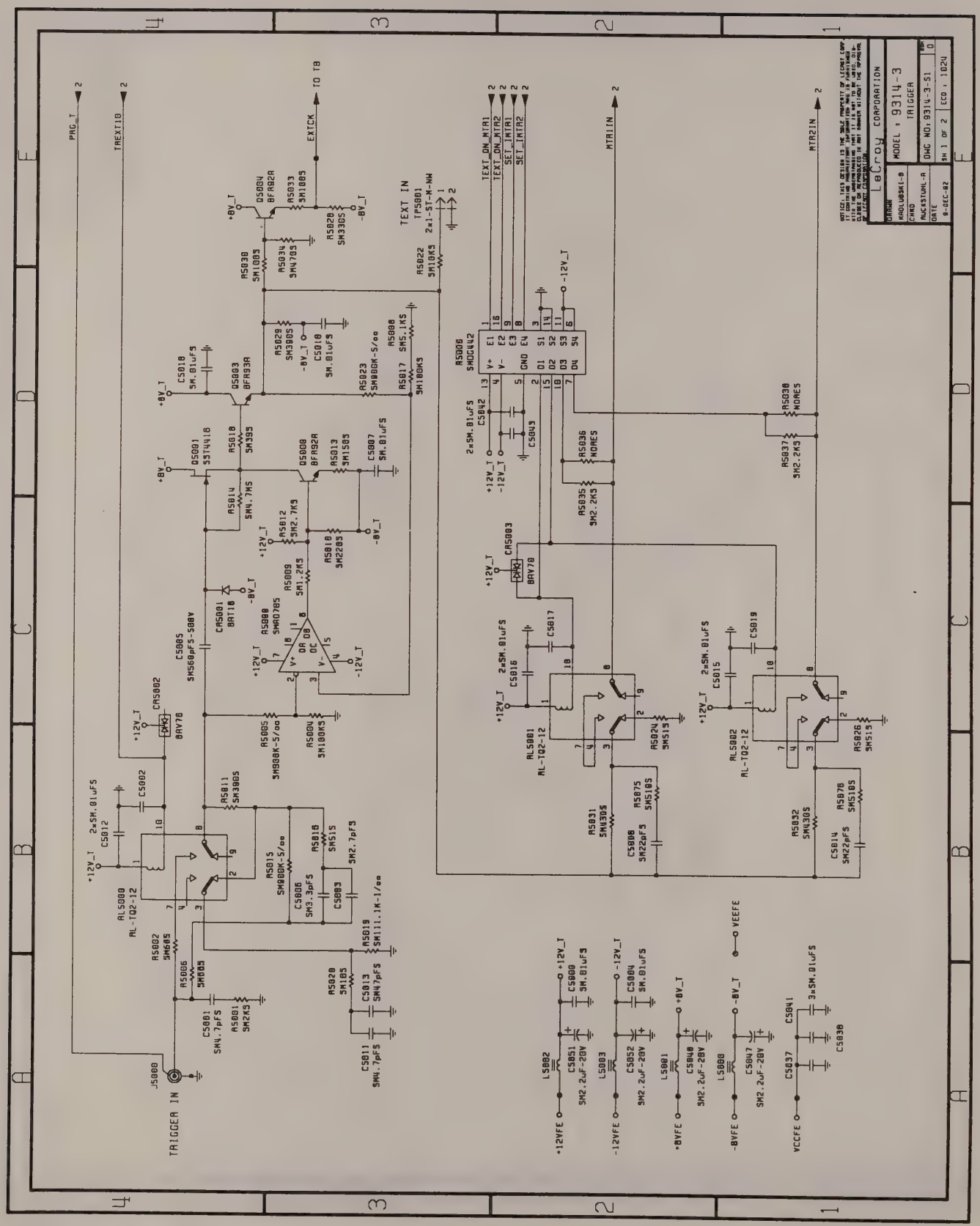

454110010
SM666377226
SM666247106
SM666247106
CONTROL VIEW B
SM666377226

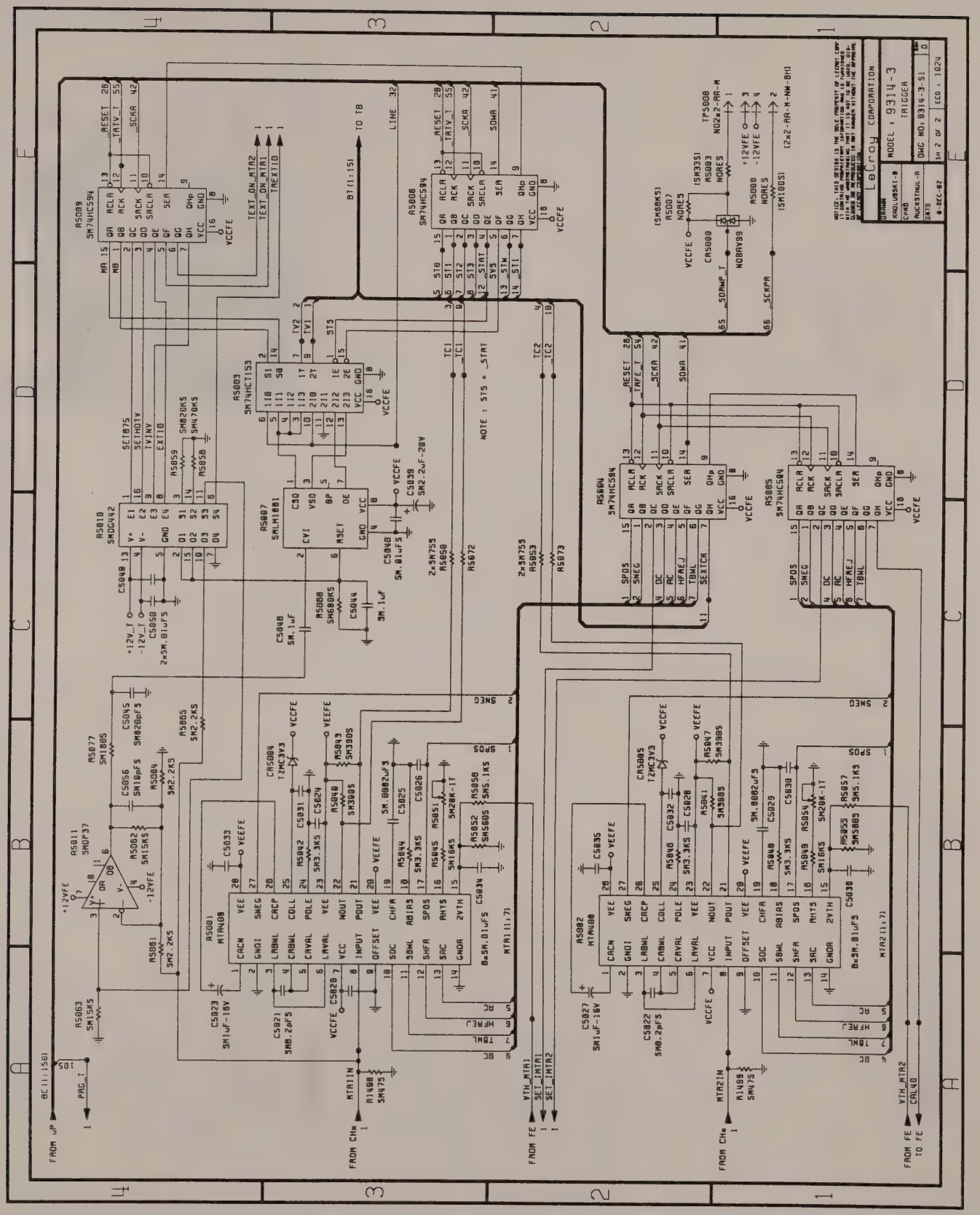

POWER 1×10-M
CONTROL VIEW B

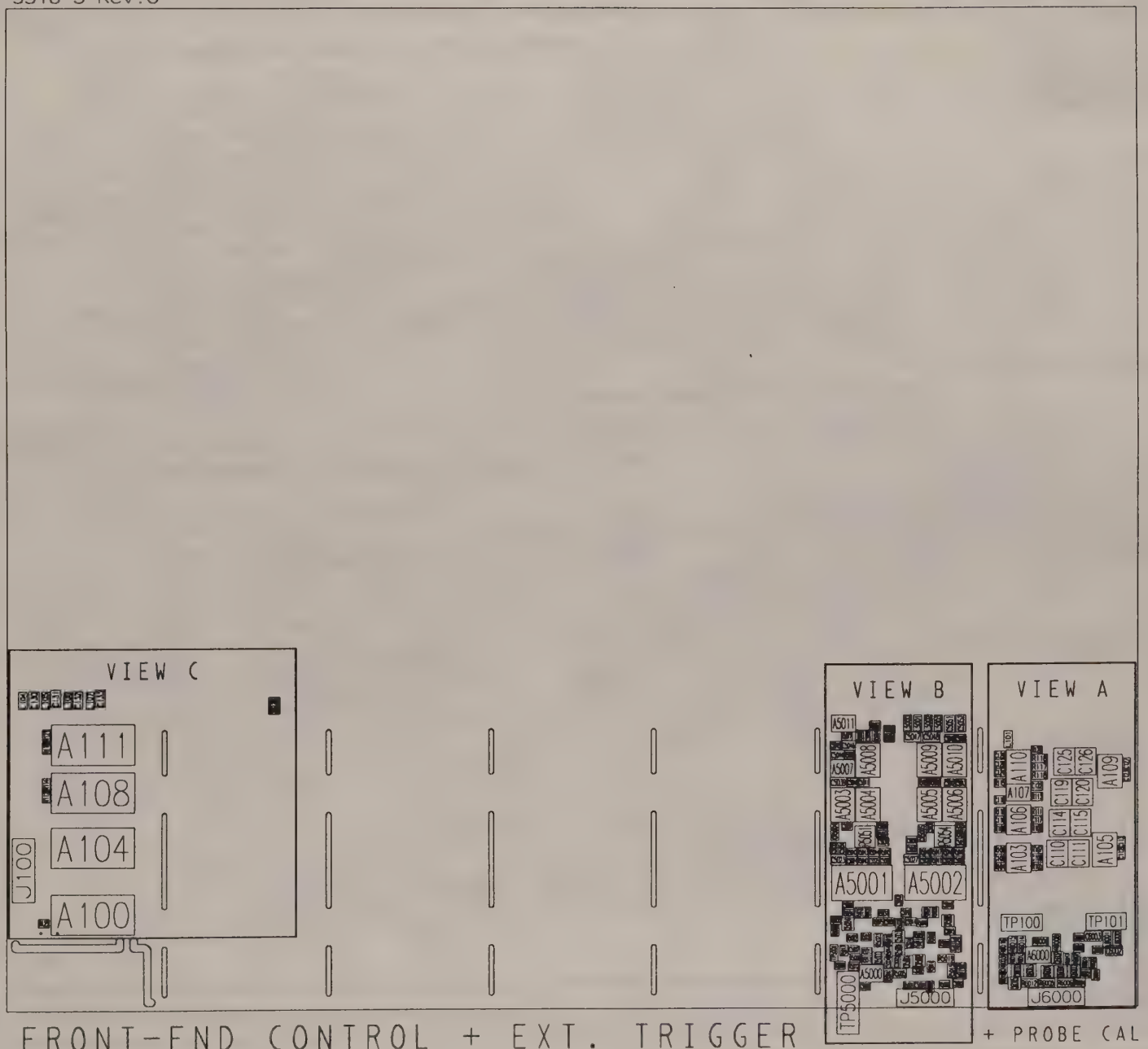

FE CHANNEL A
FE CHANNEL B
FE CHANNEL C
FE CHANNEL D
FE TRIGGER
PROBE CAL.
TO ADC
FROM TB
TO TB
LeCroy CORPORATION
MODEL : 9314-3
FRONT-END CONTROL

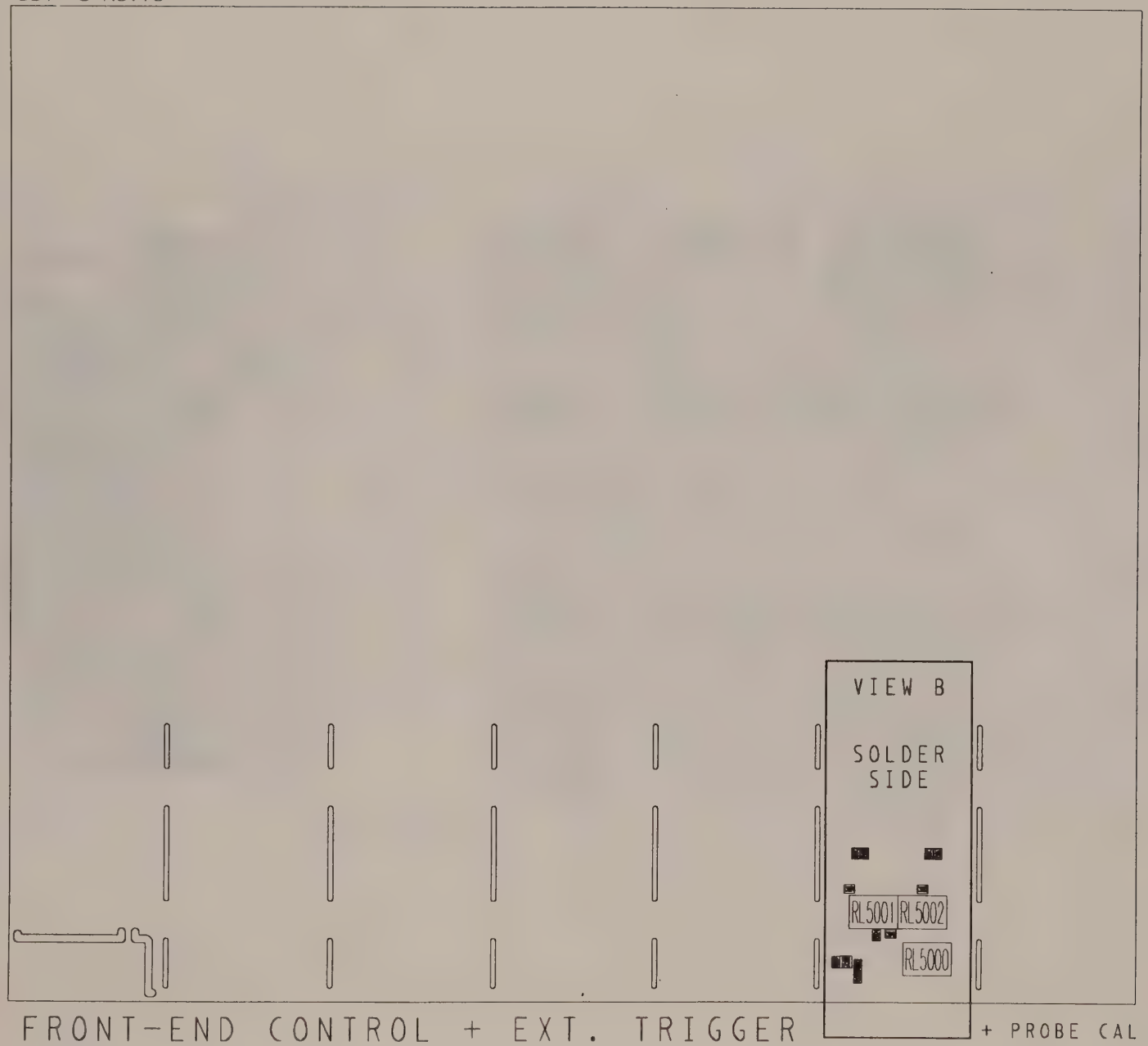

TO PROBE POWER
TO LED MONITOR
480 mA
250 mA
130 mA
280 mA
+12VFE
+8VFE
-12VFE
-8VFE
VCCFE
VEEFE
+15V
-15V
VCC
VEE
LeCroy CORPORATION
MODEL : 9314-3
PS FRONT-END
DWG NO: 9314-3-S1
SH 2 OF 2
ECO : 1024

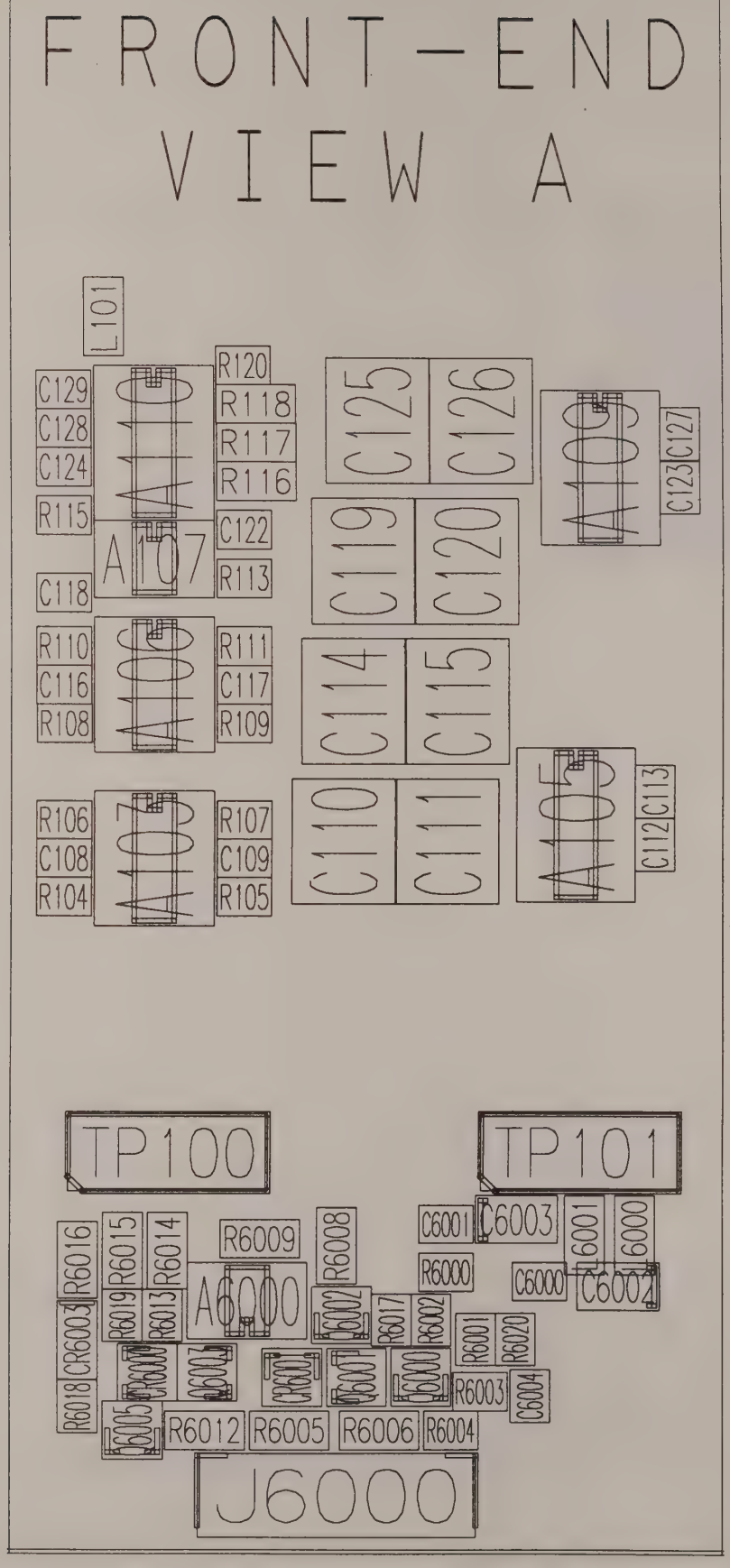

PROBE CALIBRATOR
+12VFE_P
R6008
SM100-1/oo
R6009
SM900-1/oo
+12VFE_P
R6000
SMLF353
Q6002
BF550
-12VFE_P
FROM FE
VPCAL
R6015
2xSM3.0K-1/oo
R6014
R6016
SM3.0K-1/oo
+12VFE_P
R6007
R6013
SM5.1KS
Q6003
BFA92A
-12VFE_P
R6012
SM3.0K-1/oo
+12VFE_P
CR6003
TZMC5V1
CR6000
HSMS2823
CR6001
HSMS2822
J6000
BNC-B450
R6005
R6006
2xSM100-1/oo
R6018
SM180S
R6019
SM5.1KS
Q6005
BF550
R6017
SM130S
+12VFE_P
R6008
SM1.1KS
R6020
SM510S
C6004
NOCAPS
FROM UP
CKPCAL
Q6000
BFA92A
Q6001
BFA92A
R6004
SM330S
R6001
SM1.1KS
R6002
SM390S
R6003
SM1.1KS
-12VFE_P
L6001
+12VFE
+12VFE_P
C6003
SM2.2uF-20V
C6001
SM.01uFS
L6000
-12VFE
-12VFE_P
C6002
SM2.2uF-20V
C6000
SM.01uFS
LeCroy CORPORATION
DRAWN
KAOLUBSKI B
CHKD
RUCKSTHUL-R
DATE
8-DEC-92
MODEL : 9314-3
PROBE CALIBRATOR
DWG NO: 9314-3-S1
REV
0
SH 1 OF 1
ECO : 1824

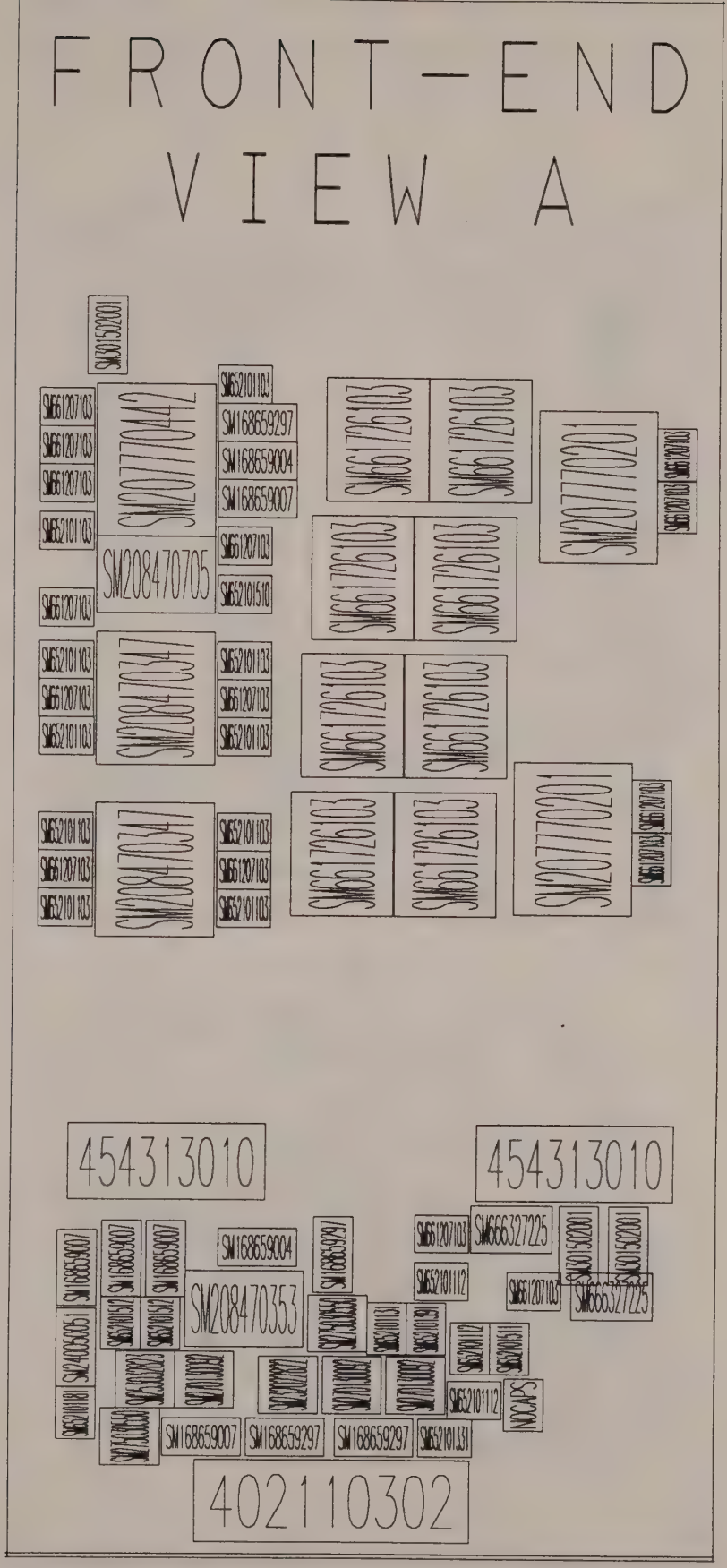

LeCroy CORPORATION
MODEL : 9314-3
TRIGGER
DWG NO: 9314-3-S1
SH 1 OF 2
ECO : 1024
TRIGGER IN
TEXT IN
TEXT_ON_MTR1
TEXT_ON_MTR2
SET_IMTR1
SET_IMTR2
MTR1IN
MTR2IN
PRG_T
TREXT10
EXTCK
TO TB
VEEFE
VCCFE
+12VFE
-12VFE
+8VFE
-8VFE

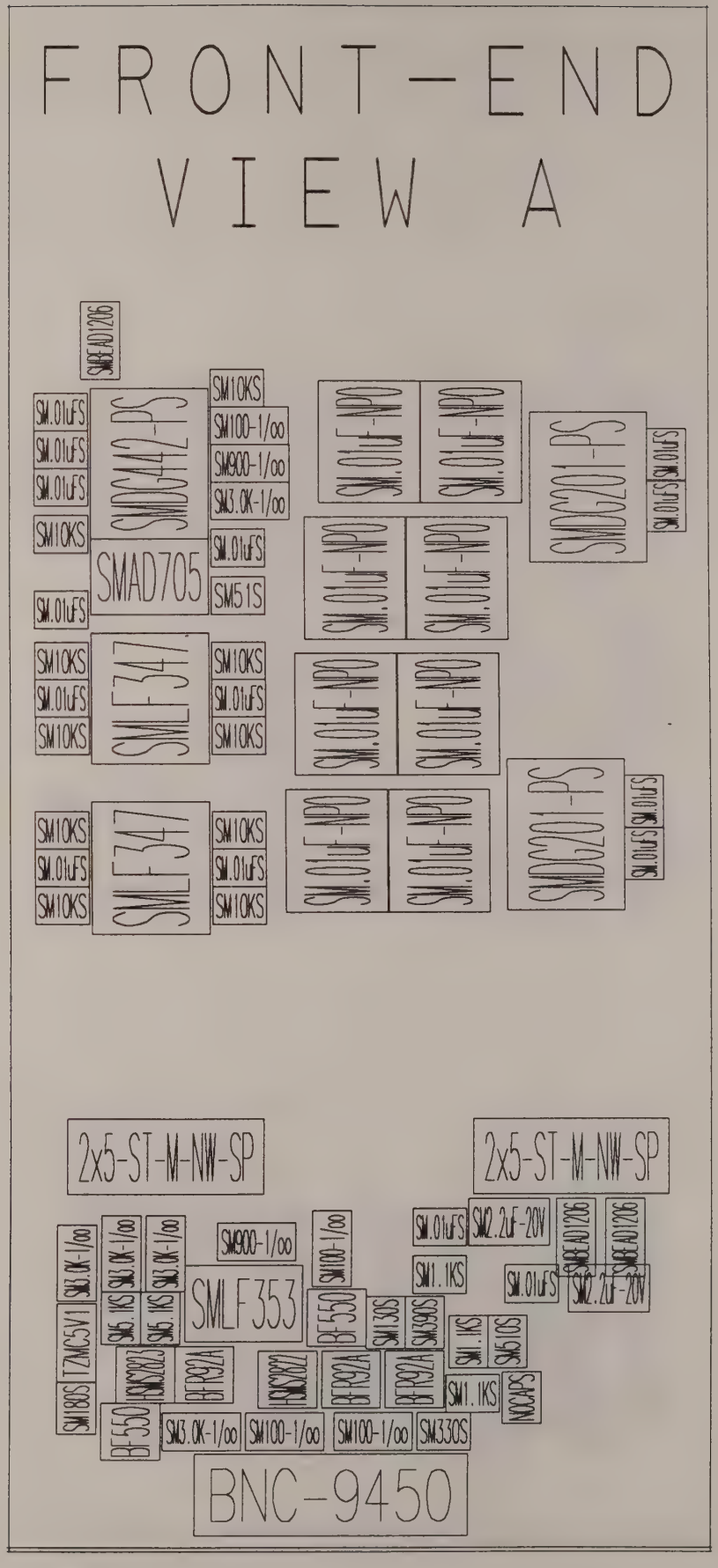

LeCroy CORPORATION
MODEL : 9314-3
TRIGGER
DWG NO: 9314-3-S1
SH 2 OF 2
ECO : 1024
NOTE : STS = _STAT

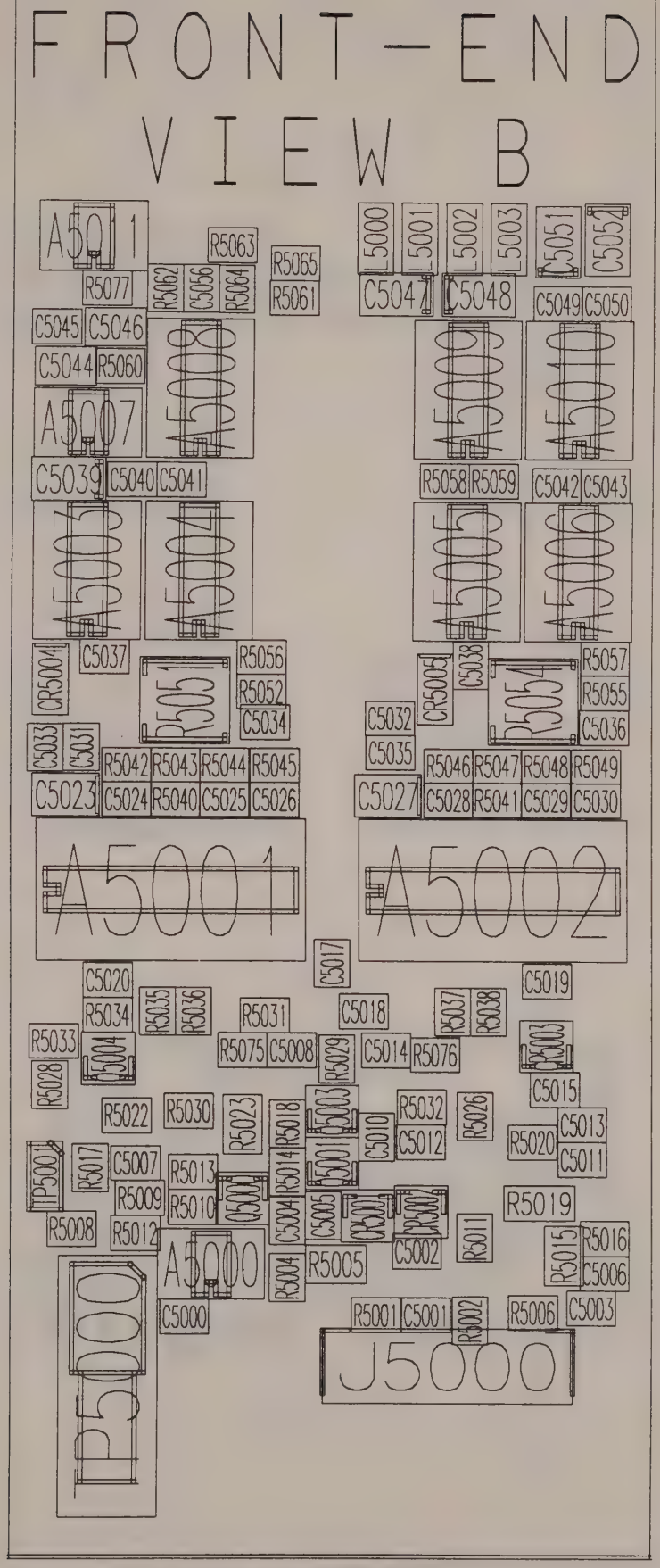

VIEW C
A111
A108
A104
A100
J100
VIEW B
A5001
A5002
J5000
TP5000
VIEW A
A110
A107
A106
A103
A109
A105
C110
C111
C114
C115
C119
C120
C125
C126
TP100
TP101
J6000
FRONT-END CONTROL + EXT. TRIGGER
+ PROBE CAL

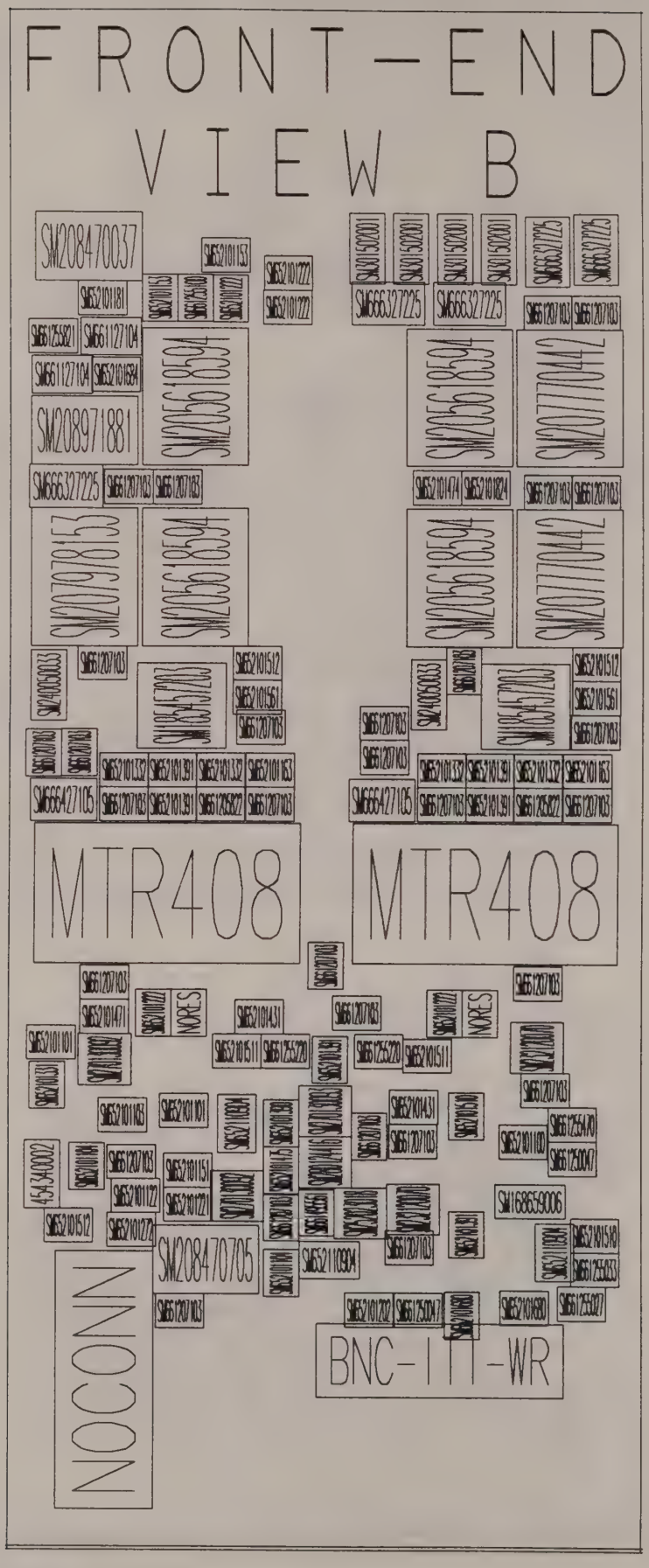

VIEW B
SOLDER SIDE
RL5001
RL5002
RL5000
FRONT-END CONTROL + EXT. TRIGGER
+ PROBE CAL

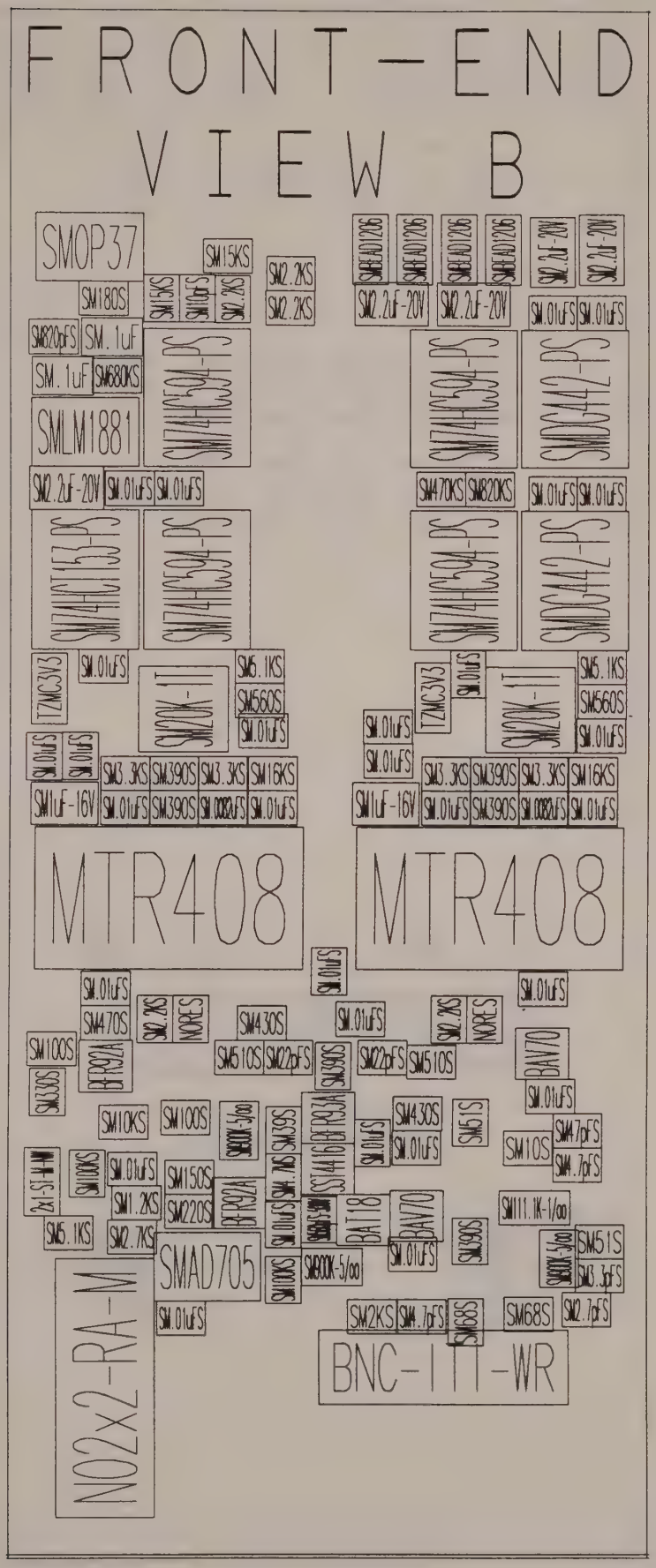

FRONT-END
VIEW A
L101
C129
C128
C124
R115
C118
A110
A107
A106
A103
A105
R120
R118
R117
R116
C122
R113
R110
C116
R108
R111
C117
R109
R106
C108
R104
R107
C109
R105
C125
C126
C119
C120
C114
C115
C110
C111
C123
C127
C112
C113
TP100
TP101
R6016
R6015
R6014
R6009
R6008
A6000
R6019
R6013
CR6003
R6018
CR6000
C6003
C6001
C6000
C6002
R6000
C6004
R6012
R6005
R6006
R6004
J6000

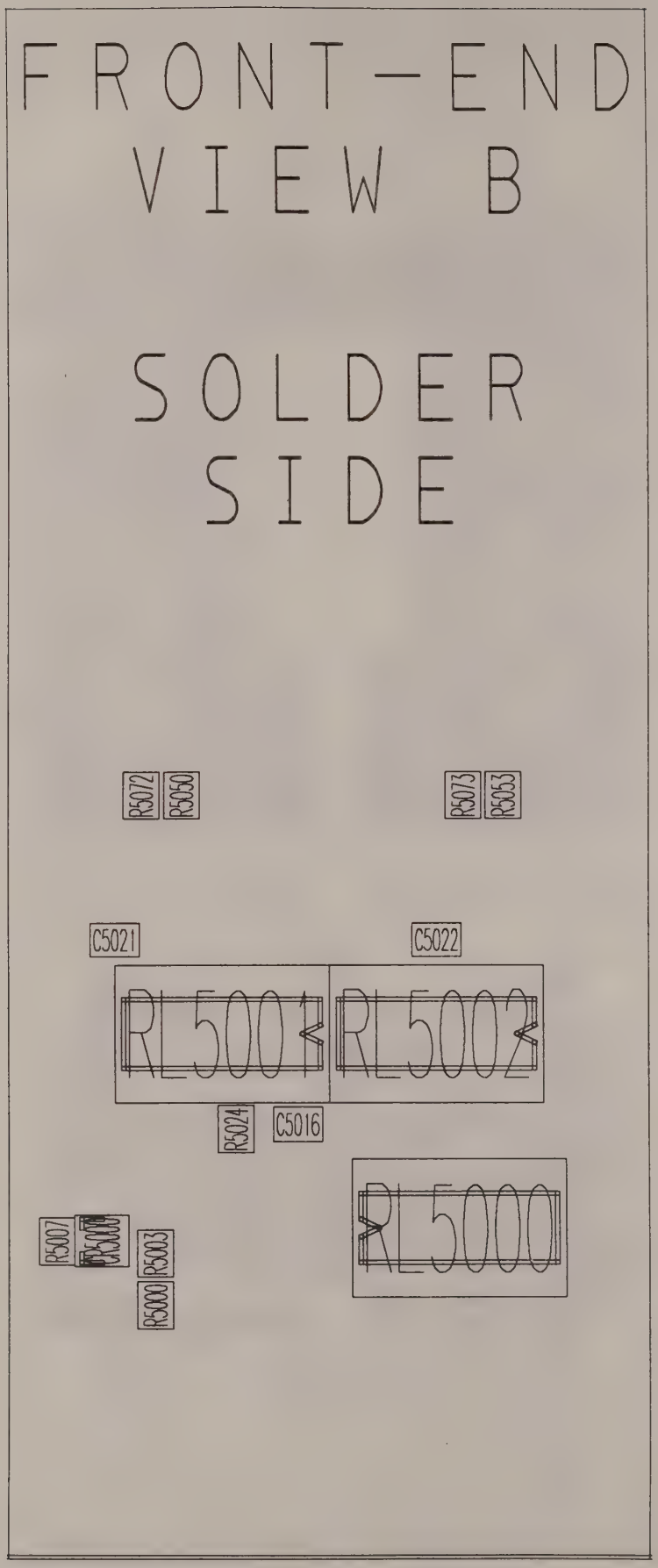

FRONT-END
VIEW A
SM207770442
SM208470705
SM208470347
SM208470347
SM207770201
SM207770201
SM208470353
454313010
454313010
402110302

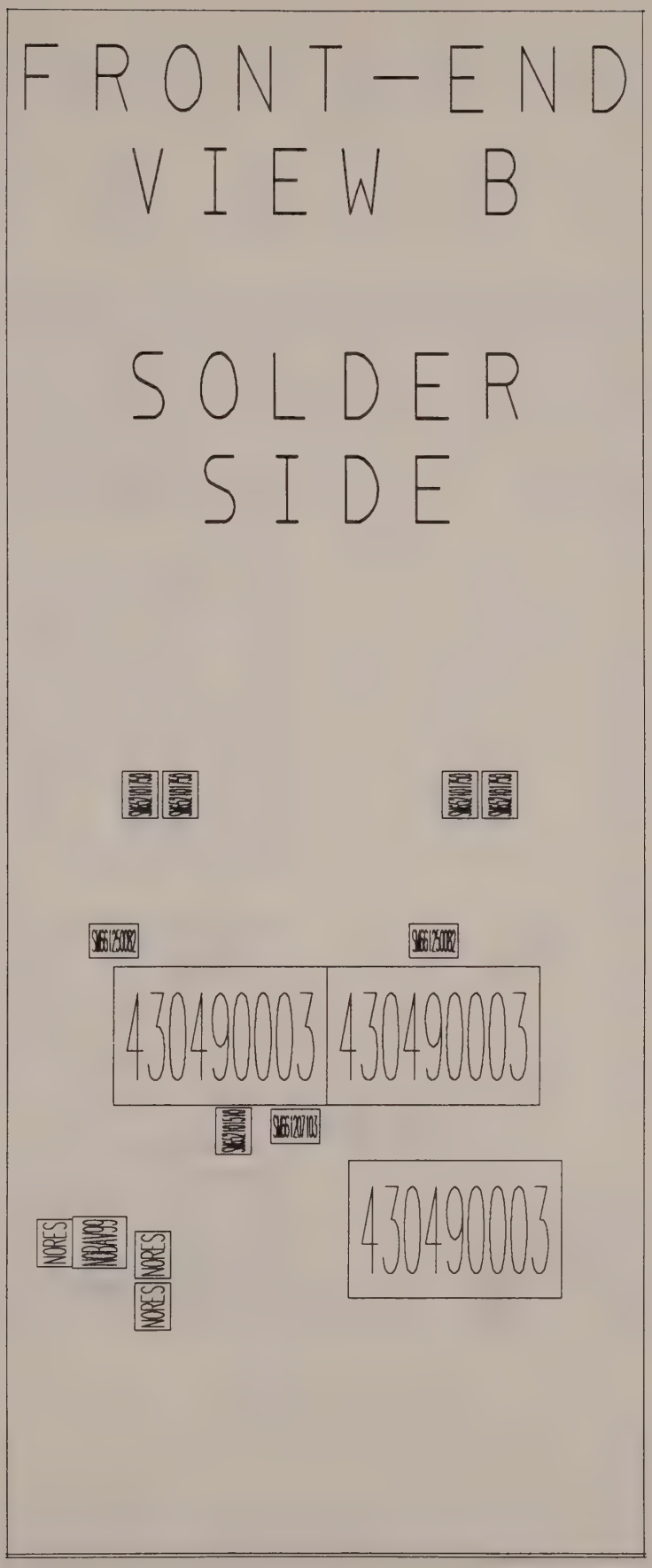

FRONT-END
VIEW A
SMDE.AD1206
SM10KS
SM.01uFS
SM100-1/∞
SM900-1/∞
SM3.0K-1/∞
SMDC0442-PS
SM.01uFS
SM.01uFS
SM.01uFS
SM10KS
SMAD705
SM.01uFS
SM51S
SM.01uFS
SM.01uF-NPO
SM.01uF-NPO
SMDC0201-PS
SM.01uFS
SM.01uF-NPO
SM.01uF-NPO
SM10KS
SM.01uFS
SM10KS
SMLF347
SM10KS
SM.01uFS
SM10KS
SM.01uF-NPO
SM.01uF-NPO
SM.01uF-NPO
SM.01uF-NPO
SMDC0201-PS
SM.01uFS
SM.01uFS
SM10KS
SM.01uFS
SM10KS
SMLF347
SM10KS
SM.01uFS
SM10KS
2x5-ST-M-NW-SP
2x5-ST-M-NW-SP
SM3.0K-1/∞
SM3.0K-1/∞
SM3.0K-1/∞
SM900-1/∞
SM100-1/∞
SM.01uFS
SM2.2uF-20V
SMDE.AD1206
SMDE.AD1206
SM1.1KS
SM.01uFS
SM2.2uF-20V
SM5.1KS
SM5.1KS
SMLF353
BF550
SM130S
SM330S
SM1.1KS
SM510S
SM180S
TZMC5V1
HSMS2823
BFR92A
HSMS2827
BFR92A
BFR92A
SM1.1KS
NOCAPS
BF550
SM3.0K-1/∞
SM100-1/∞
SM100-1/∞
SM330S
BNC-9450

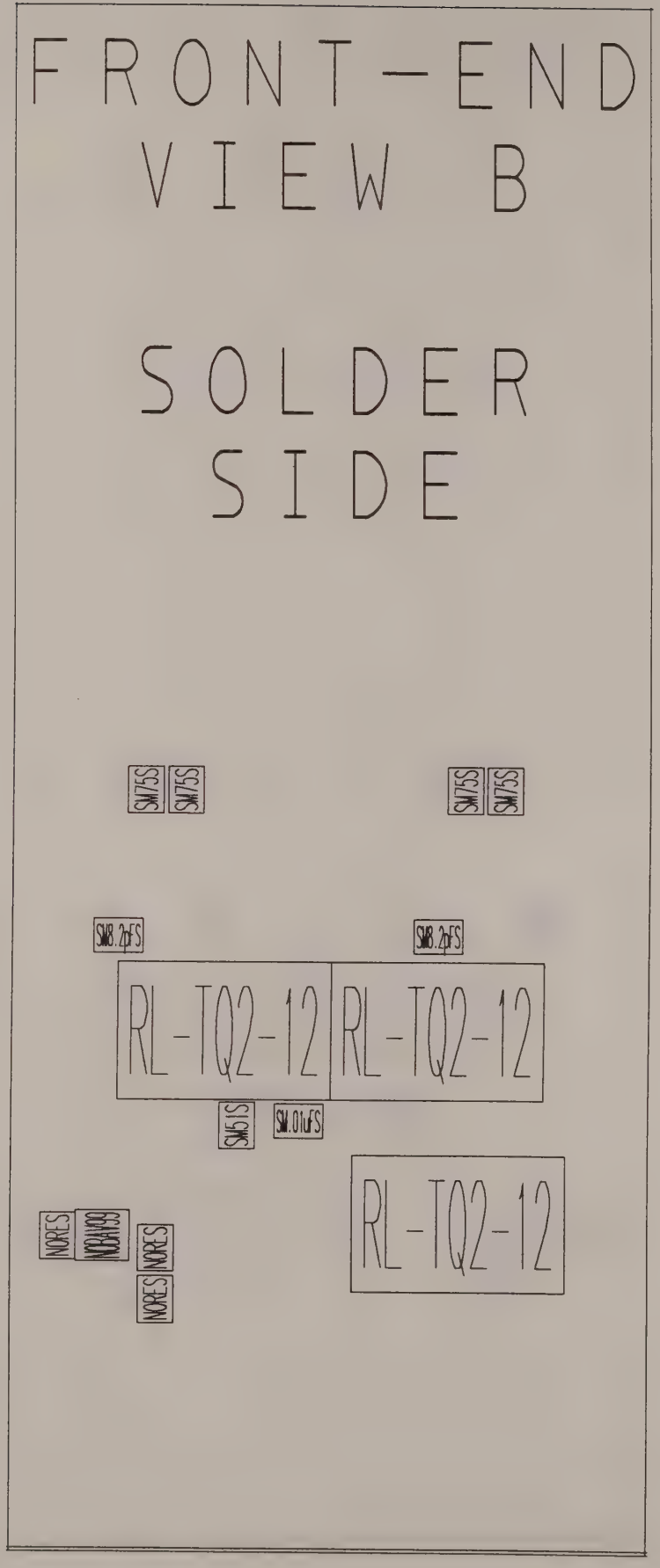

FRONT-END
VIEW B
A5011
R5063
R5065
R5061
R5077
R5062
C5056
R5064
L5000
L5001
L5002
L5003
R5051
C5052
C5047
C5048
C5049
C5050
C5045
C5046
C5044
R5060
A5008
A5009
A5010
A5007
C5039
C5040
C5041
R5058
R5059
C5042
C5043
A5003
A5004
A5005
A5006
CR5004
C5037
R5056
R5052
C5034
R5051
CR5005
C5038
R5057
R5055
C5036
R5054
C5032
C5035
C5033
C5031
R5042
R5043
R5044
R5045
R5046
R5047
R5048
R5049
C5023
C5024
R5040
C5025
C5026
C5027
C5028
R5041
C5029
C5030
A5001
A5002
C5017
C5020
R5034
R5035
R5036
R5031
C5018
R5037
R5038
C5019
R5033
C5004
R5075
C5008
R5029
C5014
R5076
C5003
R5028
C5015
R5022
R5030
R5023
R5018
C5003
R5032
R5026
C5013
C5010
C5012
R5020
C5011
TP5002
R5017
C5007
R5013
C5001
R5009
R5010
Q5000
R5014
C5004
C5005
CR5001
R5007
R5019
R5008
R5012
C5002
R5011
R5015
R5016
A5000
R5004
R5005
C5006
C5000
R5001
C5001
R5002
R5006
C5003
TP5000
J5000

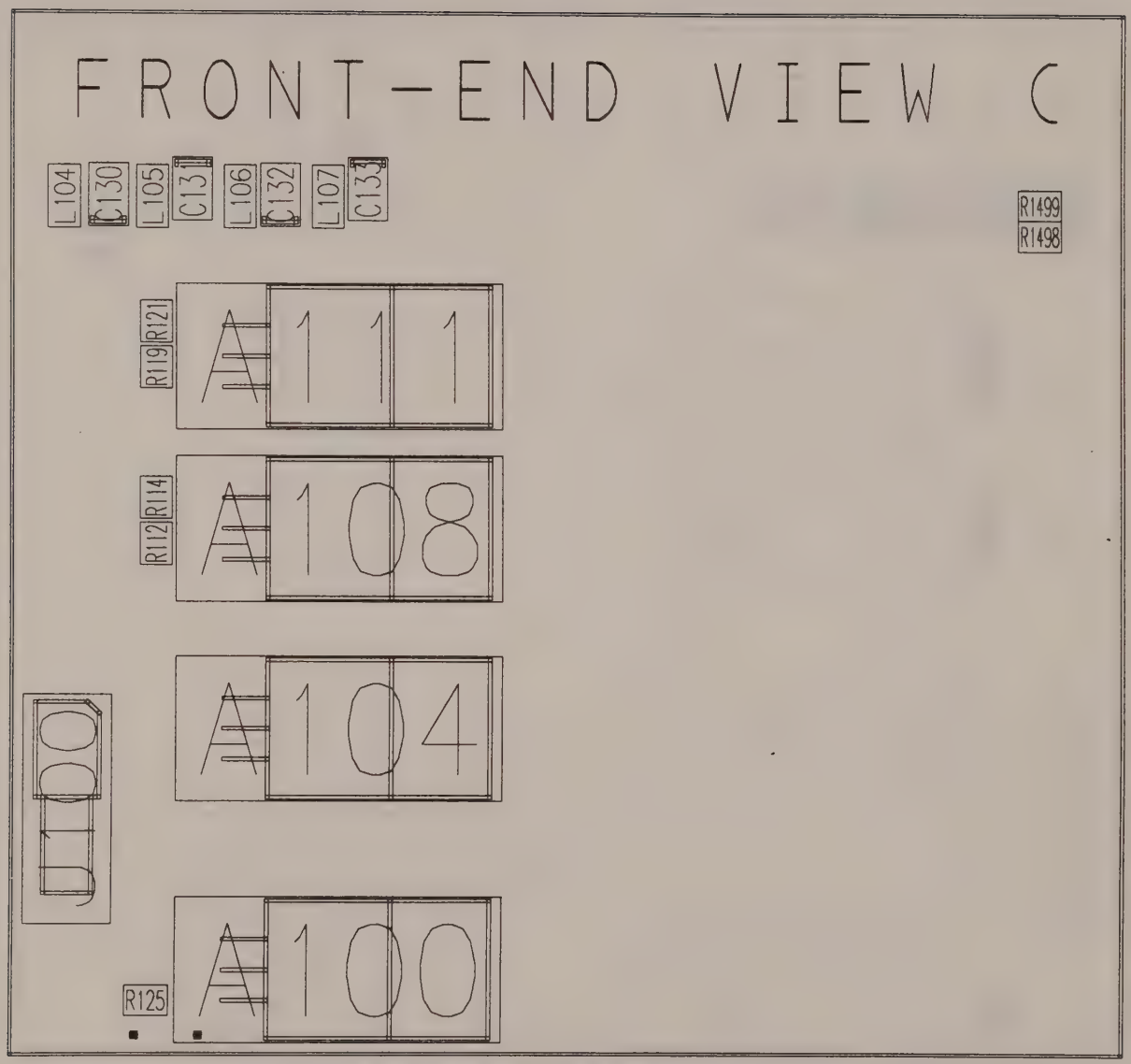

FRONT-END
VIEW B
MTR408
MTR408
NOCONN
BNC-111-WR

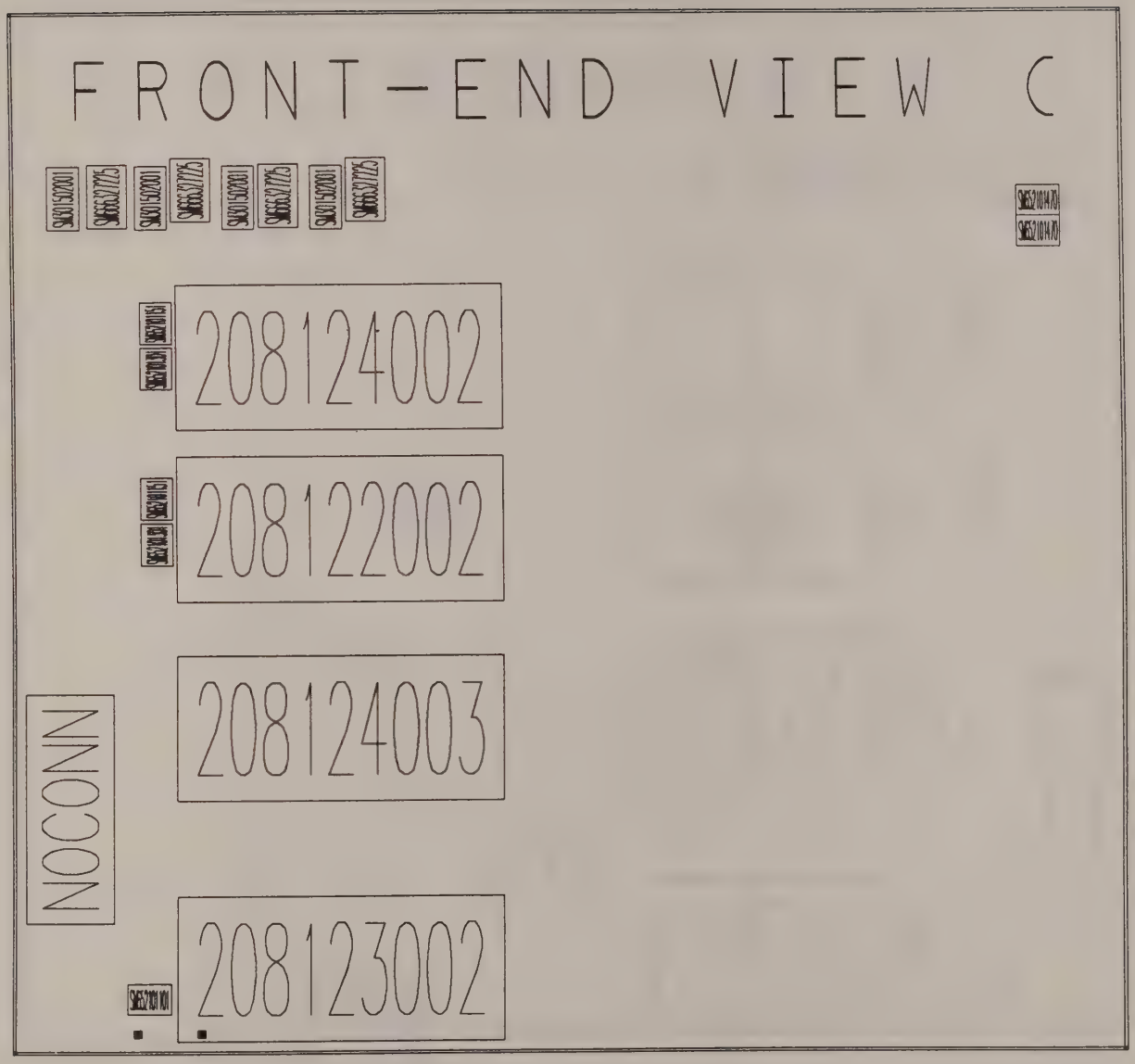

FRONT-END
VIEW B
SMOP37
SM15KS
SM2.2KS
SM180S
SM15KS
SM10pFS
SM2.2KS
SM2.2KS
SM820pFS
SM.1uF
SM.1uF
SM680KS
SMLM1881
SM74HC594-PS
SM2.2uF-20V
SM.01uFS
SM.01uFS
SM74HCT153-PS
SM74HC594-PS
TZMC3V3
SM.01uFS
SM20K-1T
SM5.1KS
SM560S
SM.01uFS
SM3.3KS
SM390S
SM3.3KS
SM16KS
SM1uF-16V
SM.01uFS
SM390S
SM.01uFS
MTR408
SM.01uFS
SM470S
SM2.2KS
NORES
SM430S
SM.01uFS
SM100S
BFR92A
SM510S
SM22pFS
SM390S
SM22pFS
SM510S
SM330S
SM10KS
SM100S
SM39S
BFR93A
SM430S
SM51S
SM.01uFS
SM10S
SM47pFS
SM4.7pFS
SM100KS
SM.01uFS
SM150S
SM1.2KS
SM220S
BFR92A
SST4416
BAT18
BAV70
SM111.1K-1/oo
SM5.1KS
SM2.7KS
SMAD705
SM390S
SM51S
SM3.3pFS
SM100KS
SM900K-5/oo
SM.01uFS
SM2KS
SM4.7pFS
SM68S
SM68S
SM2.7pFS
N02x2-RA-M
BNC-111-WR

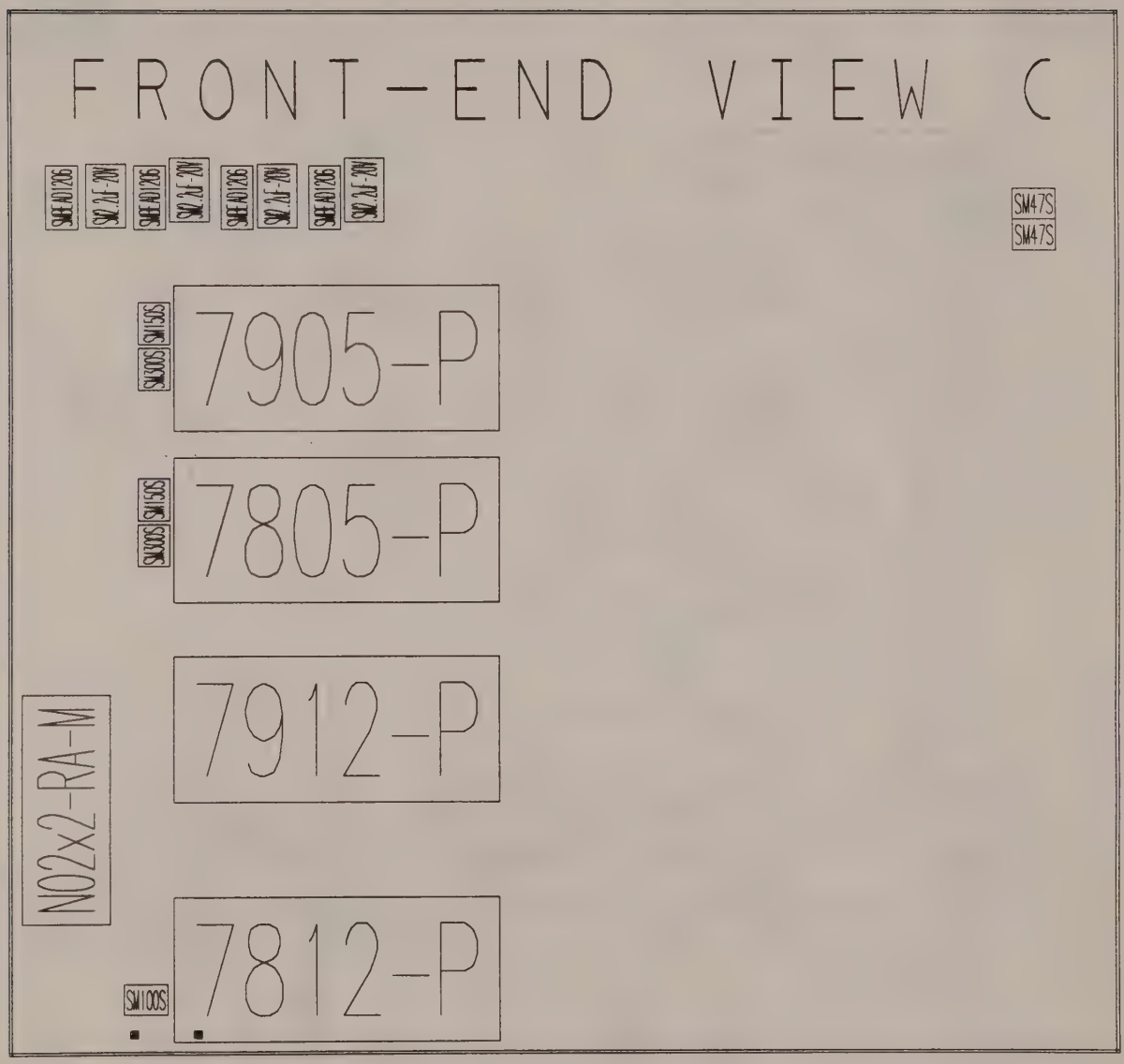

FRONT-END
VIEW B
SOLDER
SIDE
R5072
R5050
R5073
R5053
C5021
C5022
RL5001
RL5002
R5024
C5016
RL5000
R5007
R5003
R5000

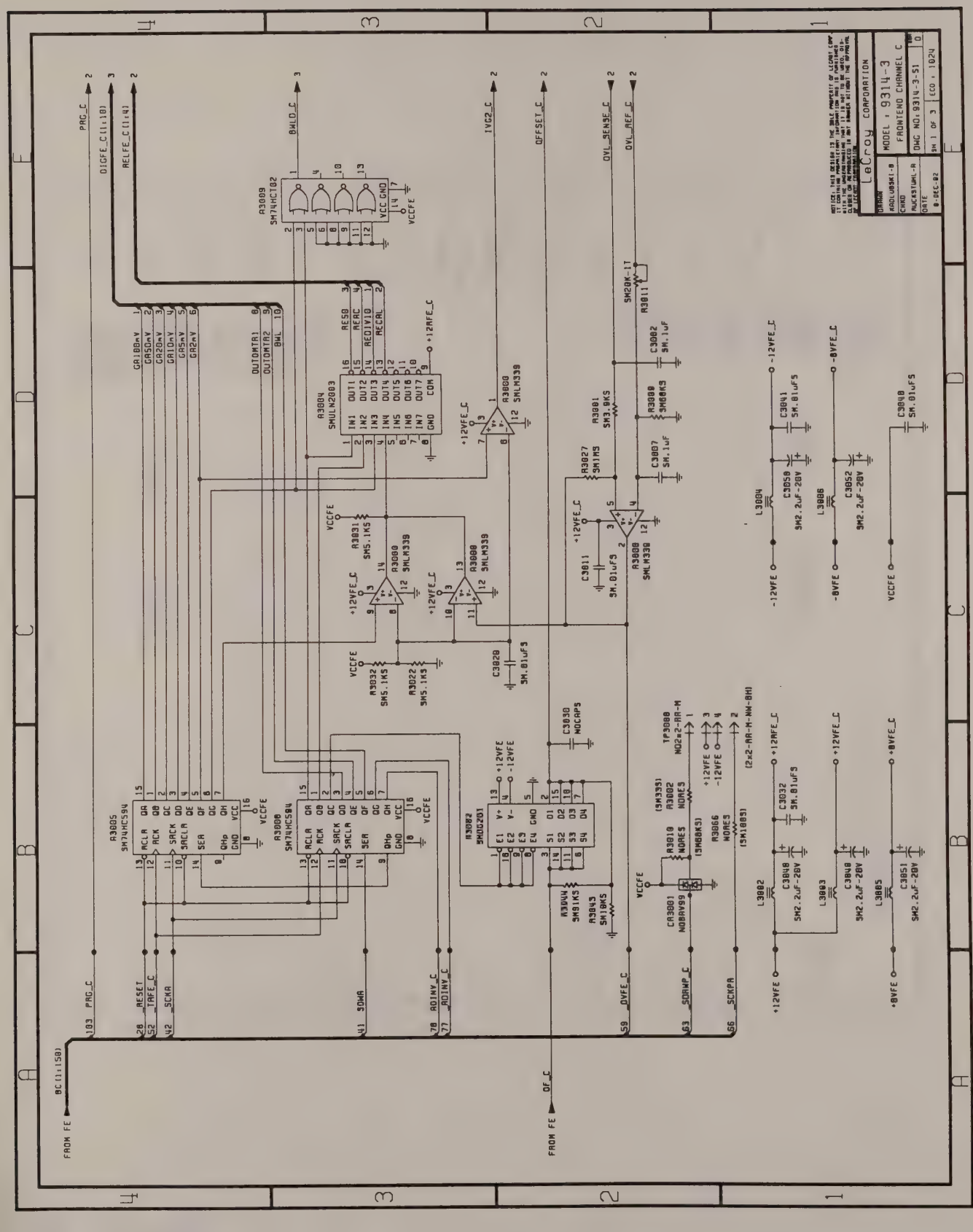

FRONT-END
VIEW B
SOLDER
SIDE
430490003
430490003
430490003

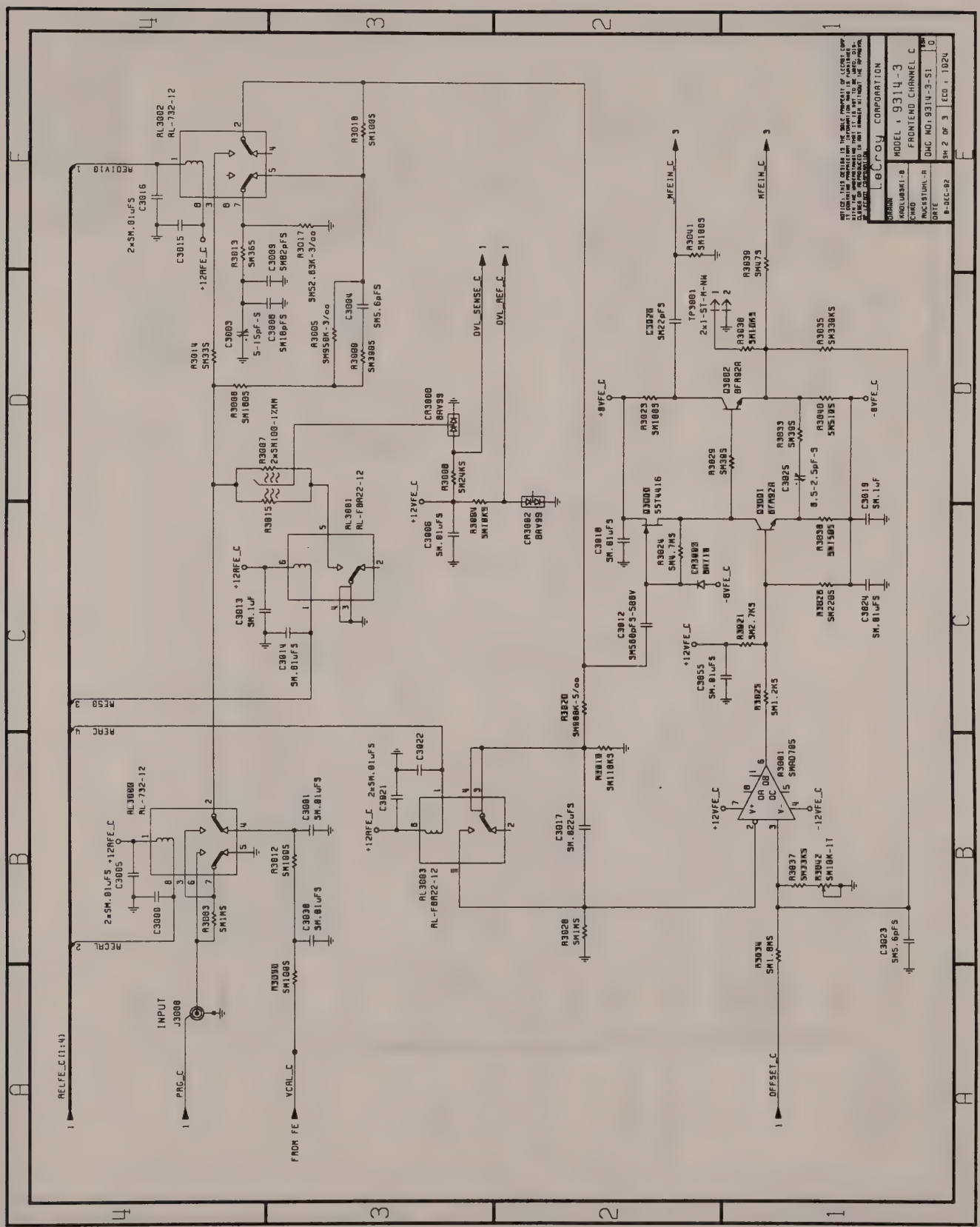

FRONT-END
VIEW B
SOLDER
SIDE
SM75S
SM75S
SM75S
SM75S
SM8.2pFS
SM8.2pFS
RL-TQ2-12
RL-TQ2-12
SM51S
SM.01uFS
RL-TQ2-12
NORES
NORES
NORES
NORES

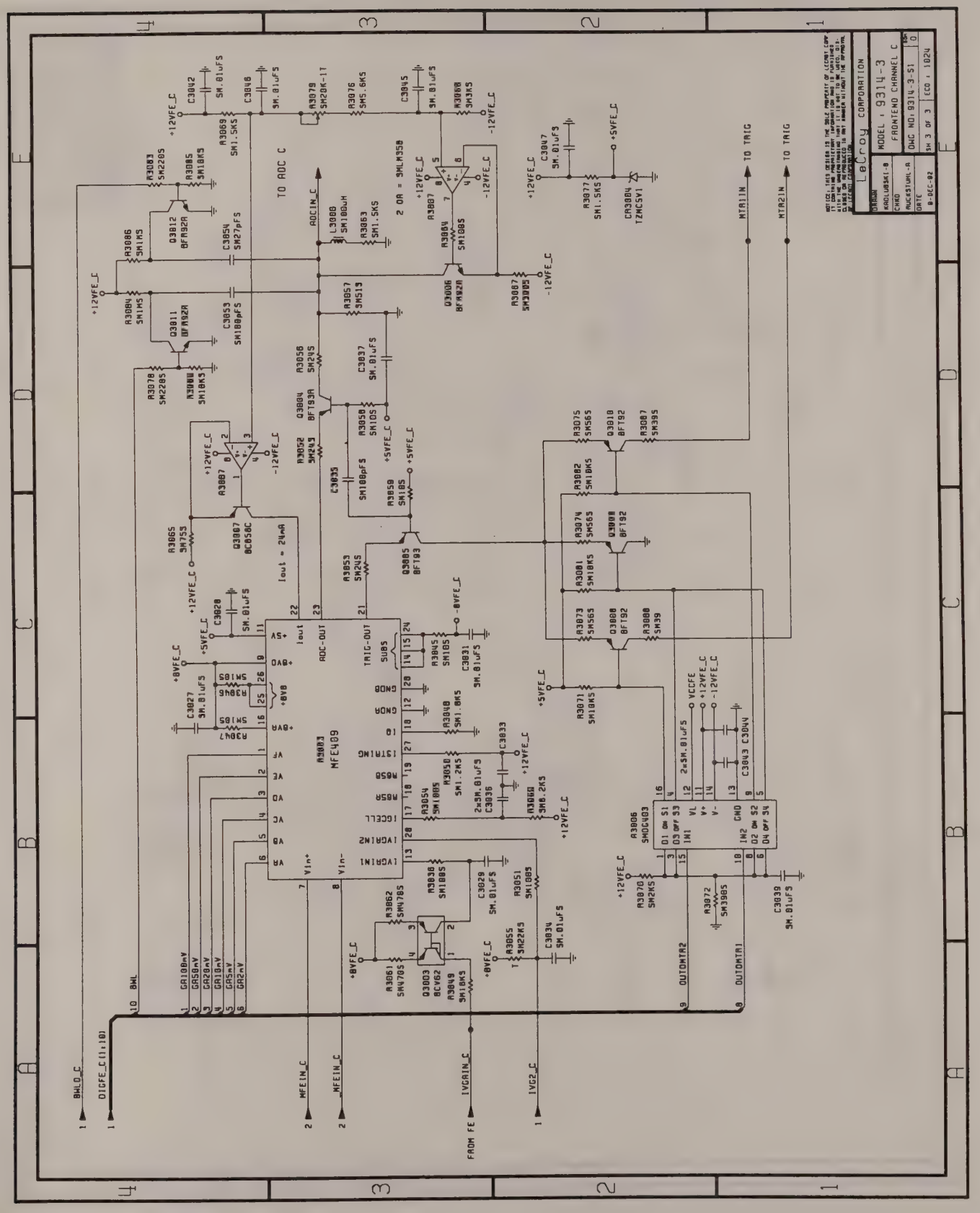

FRONT-END VIEW C
L104
C130
L105
C131
L106
C132
L107
C133
R1499
R1498
R119
R121
A111
R112
R114
A108
A104
U100
A100
R125

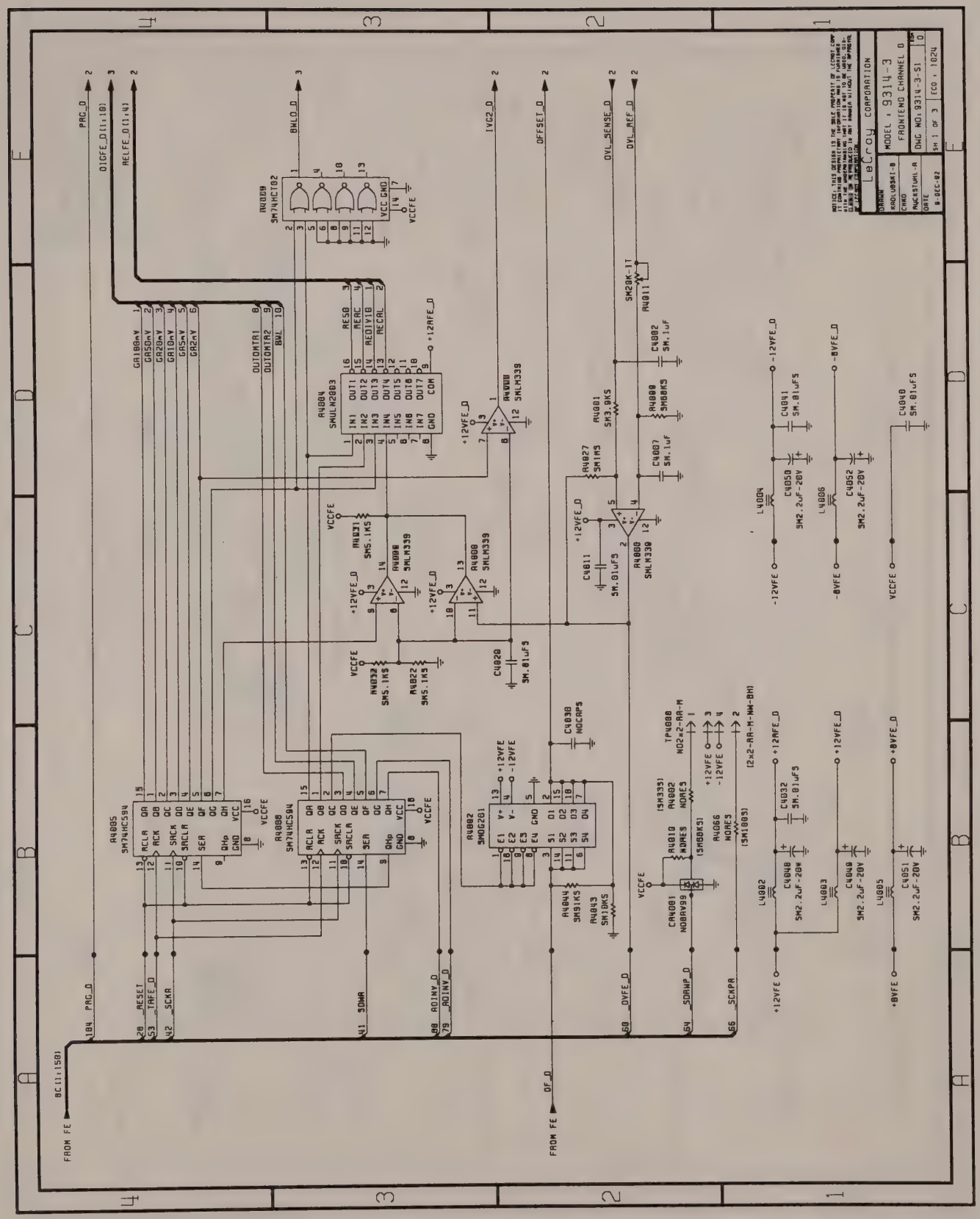

FRONT-END VIEW C
208124002
208122002
208124003
208123002
NOCONN

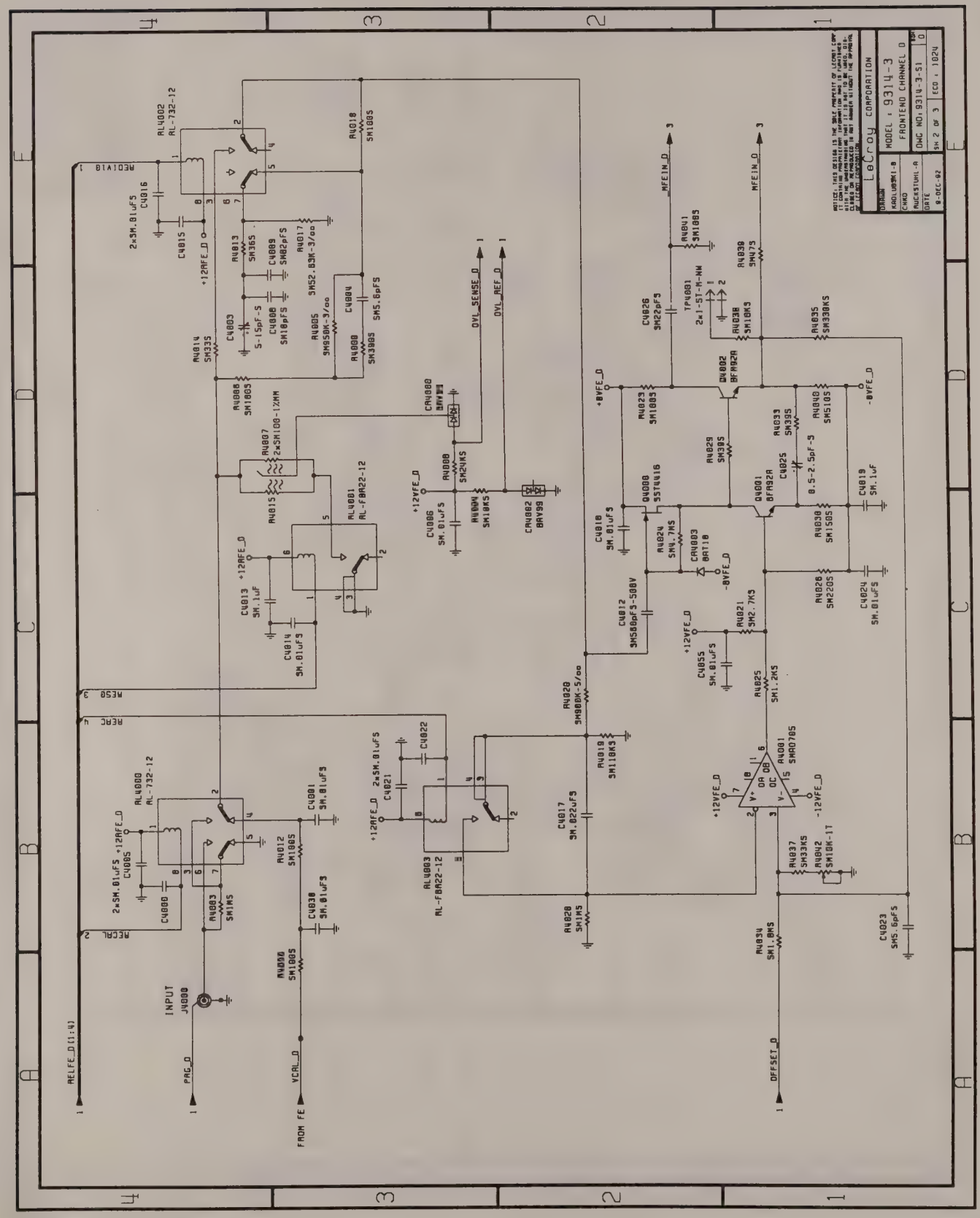

FRONT-END VIEW C
SM47S
SM47S
SM150S
SM300S
7905-P
SM150S
SM300S
7805-P
7912-P
N02x2-RA-M
SM100S
7812-P

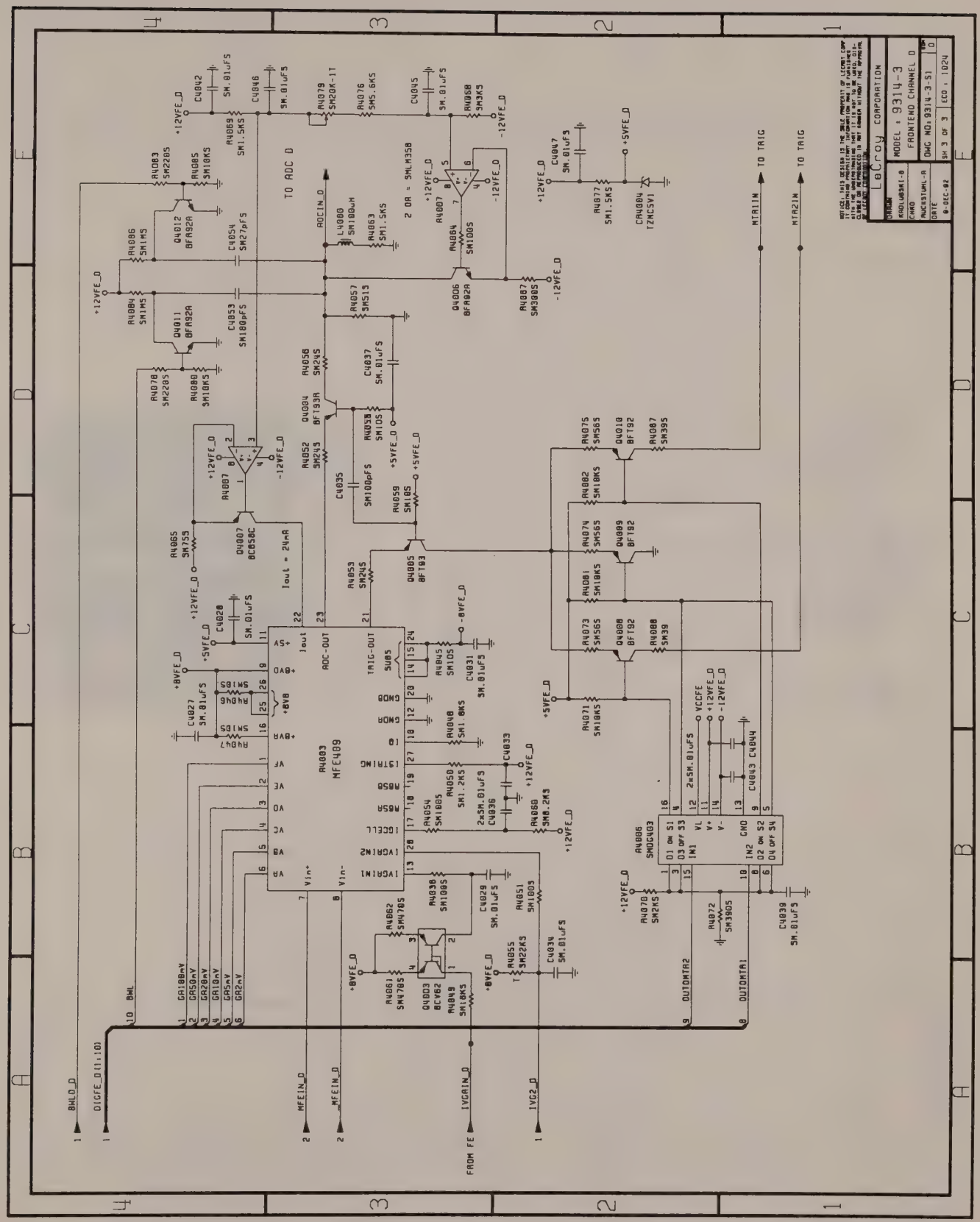



LeCroy CORPORATION
MODEL : 9314-3
FRONTIEND CHANNEL C
DWG NO: 9314-3-S1
SH 2 OF 3
ECO : 1024
INPUT J3000
FROM FE
PRG_C
VCAL_C
OFFSET_C
RELFE_C(1:4)
OVL_SENSE_C
OVL_REF_C
MFEIN_C
+12VFE_C
-12VFE_C
+8VFE_C
-8VFE_C
RL3002 AL-732-12
RL3001 AL-FBR22-12
RL3003 AL-FBR22-12
RL3000 AL-732-12
Q3000 SST4416
Q3001 BFR92A
Q3002 BFR92A
A3001 SMAD705
TP3001 2x1-ST-M-NW
CR3000 BAV99
CR3001 BAV99
CR3002 BAV99
CR3003 BAV70
J3000

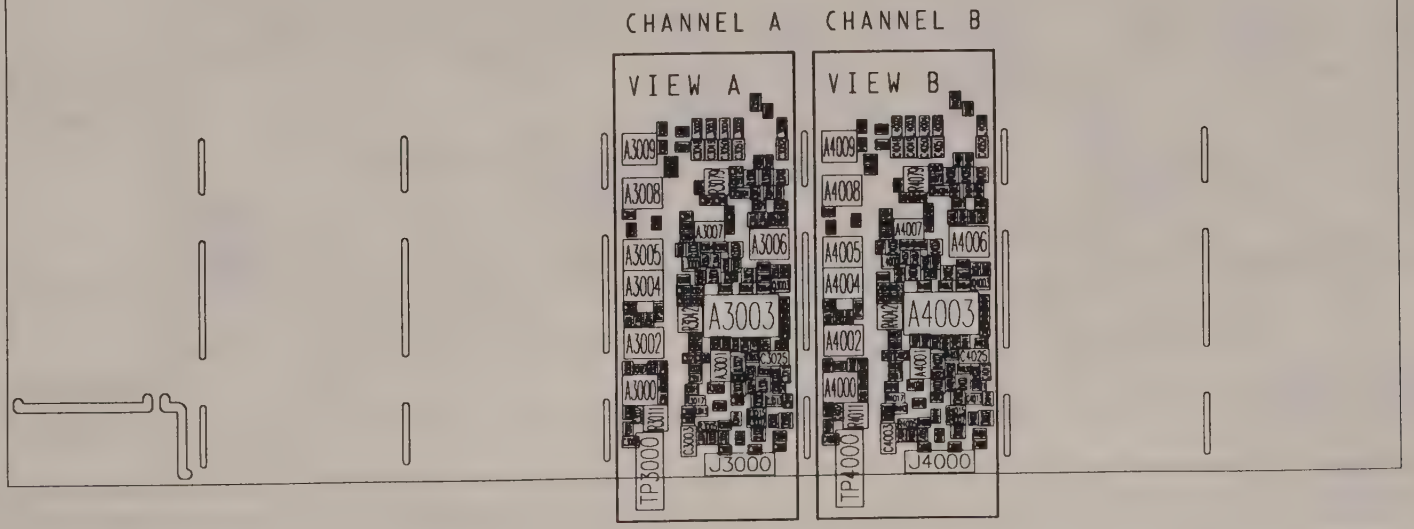

LeCroy CORPORATION
MODEL : 9314-3
FRONTEND CHANNEL C
DWG NO: 9314-3-S1
SH 3 OF 3
ECO : 1024
TO ADC C
TO TRIG
TO TRIG
MTR1IN
MTR2IN
MFE409
ADC-OUT
TRIG-OUT
SUBS
GND
ID
ISTRING
MSB
ICCELL
IVGAIN2
IVGAIN1
Vin+
Vin-
VF
VD
VC
VB
VA
+8V
+5V
-8V
+12VFE_C
-12VFE_C
+5VFE_C
VCCFE
BWL
GA100mV
GA50mV
GA20mV
GA10mV
GA5mV
GA2mV
OUTOMTR2
OUTOMTR1
BWLO_C
DIGFE_C(1:10)
MFEIN_C
_MFEIN_C
IVGAIN_C
FROM FE
IVG2_C
2 OR = SML358
Iout = 24mA
SMD4C403
Q1 on S1
Q3 off S3
IN1
V+
V-
IN2
GND
Q2 on S2
Q4 off S4


LeCroy CORPORATION
MODEL : 9314-3
FRONTEND CHANNEL B
DWG NO: 9314-3-S1
SH 1 OF 3
ECO : 1024
DRAWN KROLUSKI-B
CHKD
DATE 9-DEC-92
FROM FE
PRG_D
DIGFE_D(1:10)
RELFE_D(1:4)
BWLD_D
IVG2_D
OFFSET_D
OVL_SENSE_D
OVL_REF_D
BC(1:150)
OF_D
RESET
TAFE_D
SCKA
SDWA
ADINV_D
OVFE_D
SDRWP_D
SCKPA
+12VFE
-12VFE
-8VFE
+8VFE
VCCFE
+12AFE_D
+12VFE_D
-12VFE_D
-8VFE_D
+8VFE_D
A4005 SM74HC594
A4008 SM74HC594
A4002 SMDG201
A4004 SMULN2003
A4000 SMLM339
A4009 SM74HCT02
A4011 SM20K-1T
A4001 SM3.9K5
A4007 SM.1uF
A4027 SM1M5
A4011 SM.01uF5
A4032 SM5.1K5
A4022 SM5.1K5
A4020 SM.01uF5
A4044 SM91K5
A4043 SM10K5
A4010 NORES
A4066 NORES
CA4001 NOBRV99
TP4008 NO2x2-RA-M
(2x2-RA-M-NW-BH)
C4030 NOCAPS
C4032 SM.01uF5
C4040 SM.01uF5
C4041 SM.01uF5
C4050 SM2.2uF-20V
C4052 SM2.2uF-20V
C4048 SM2.2uF-20V
C4049 SM2.2uF-20V
C4051 SM2.2uF-20V
L4002
L4003
L4004
L4005
L4006

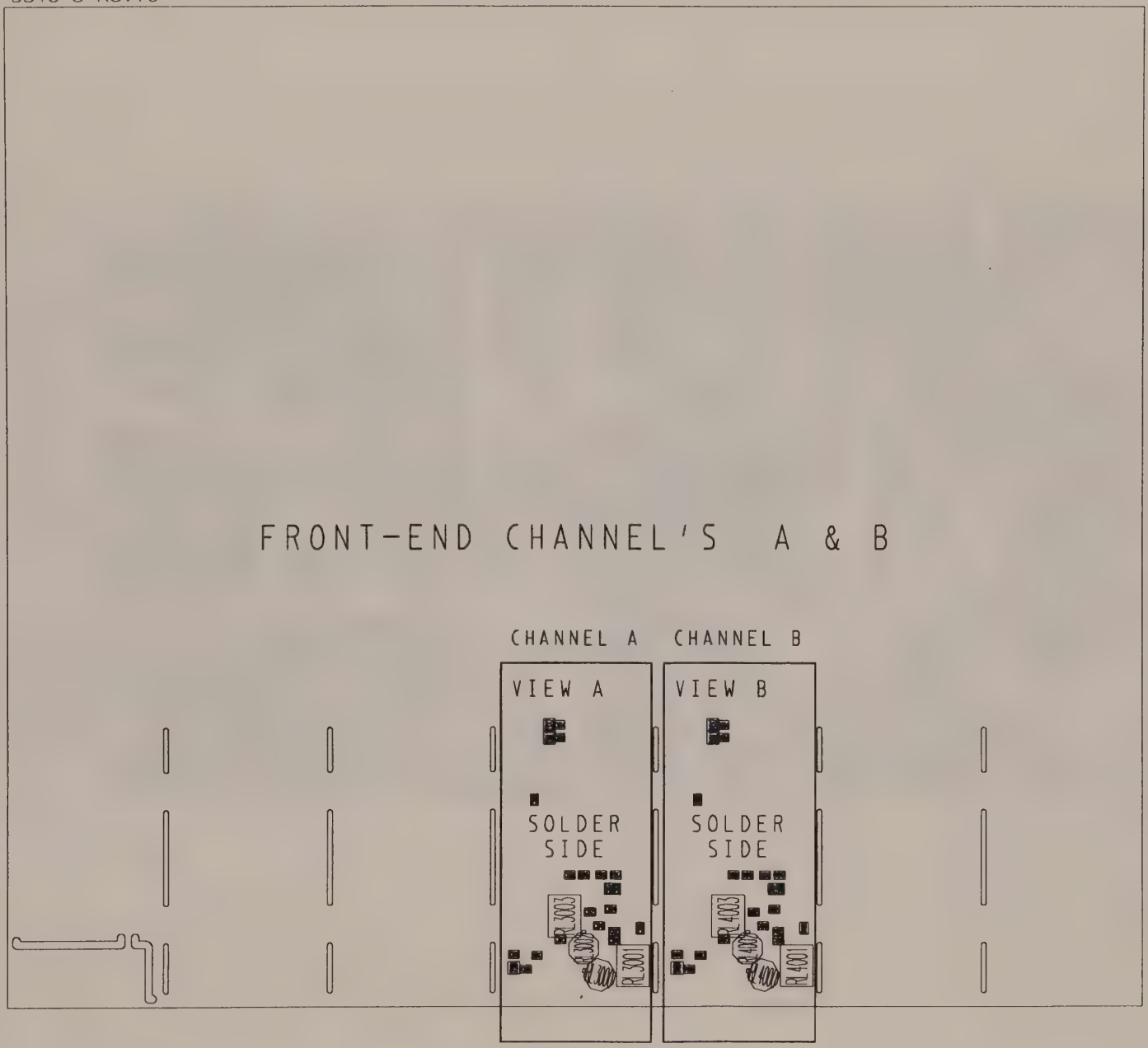

LeCroy CORPORATION
MODEL : 9314-3
FRONTEND CHANNEL D
DWG NO: 9314-3-S1
SH 2 OF 3
ECO : 1024
9-DEC-92
RELFE_D(1:4)
PAG_D
VCAL_D
FROM FE
OFFSET_D
INPUT
J4000
OVL_SENSE_D
OVL_REF_D
MFEIN_D
+12VFE_D
-12VFE_D
+8VFE_D
-8VFE_D
RECAL 2
RECAL 4
RESO 3
REDIV10

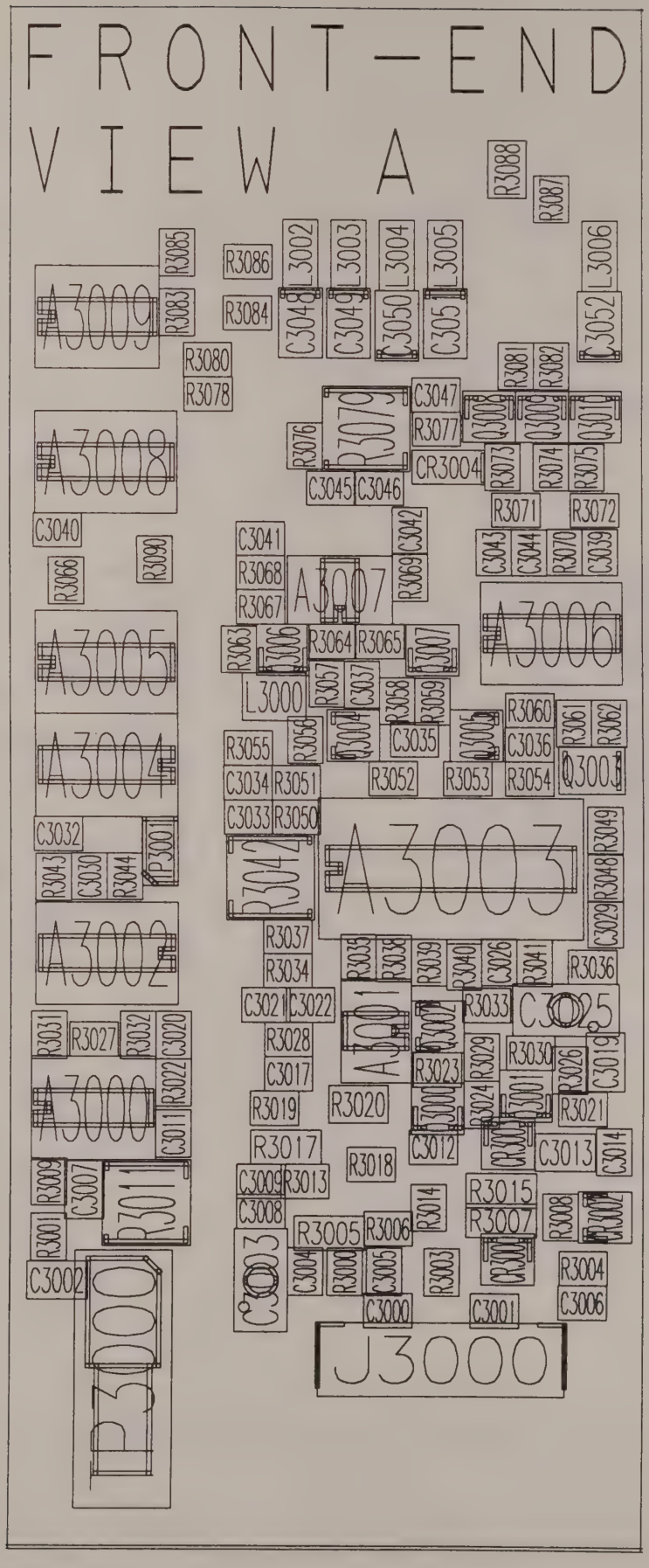

LeCroy CORPORATION
MODEL : 9314-3
FRONTEND CHANNEL D
DWG NO: 9314-3-S1
SH 3 OF 3
ECO : 1024
TO ADC D
TO TRIG
TO TRIG
FROM FE
BHLD_D
DIGFE_D[1:10]
MFEIN_D
MFEIN_D
IVGAIN_D
IVC2_D

FRONT-END CHANNEL'S A & B

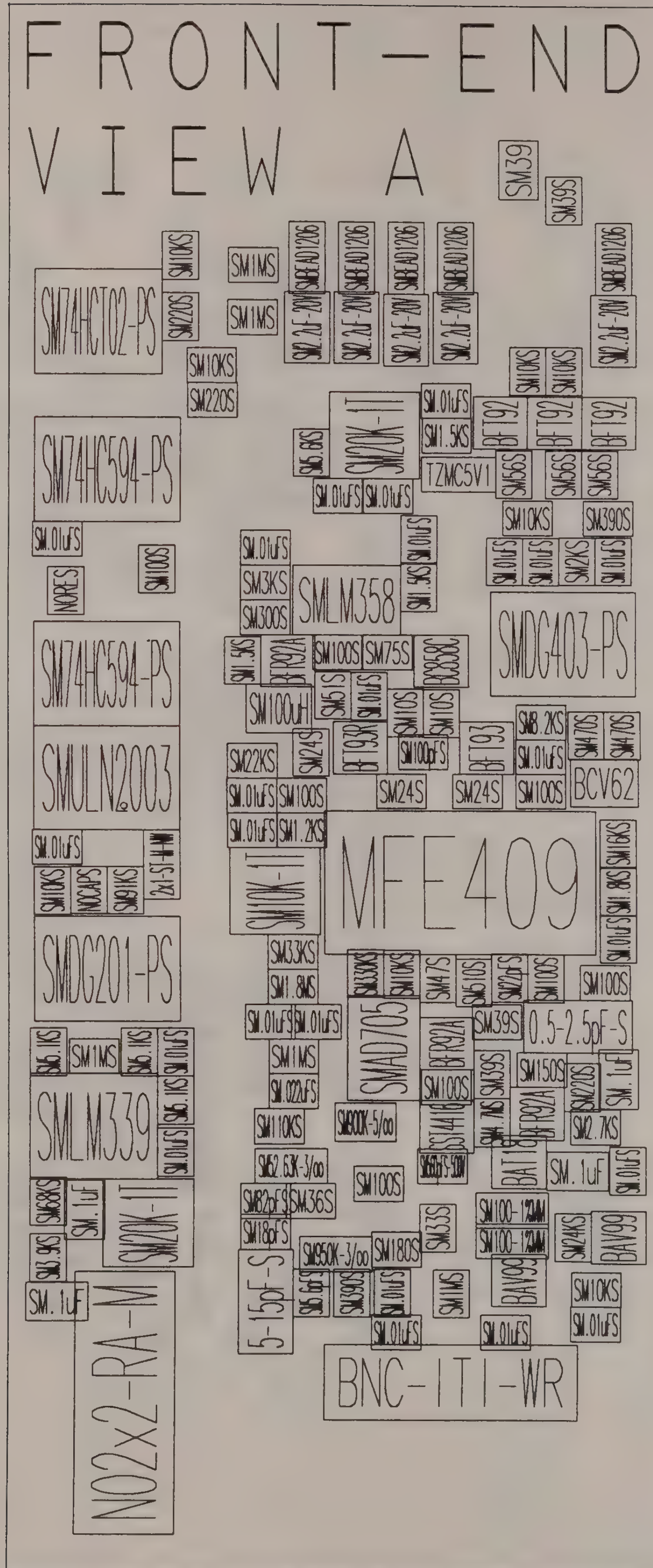


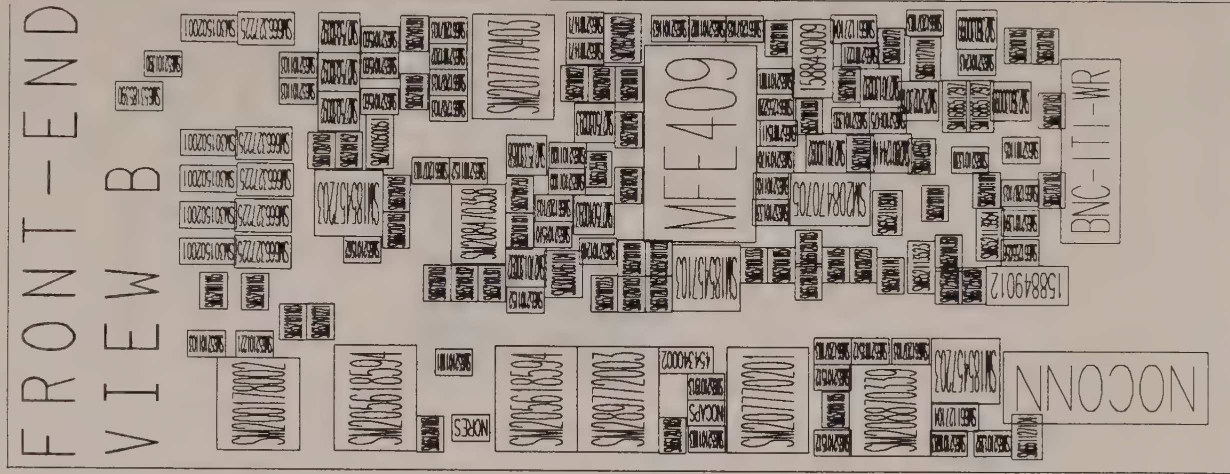
9310-3 Rev:G

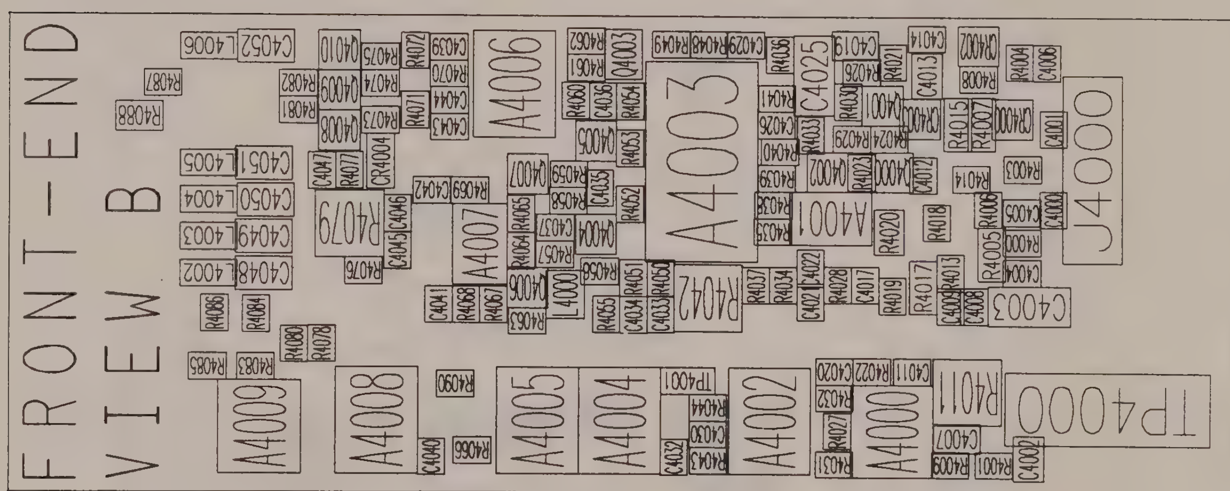

FRONT-END CHANNEL'S A & B
CHANNEL A
CHANNEL B
VIEW A
VIEW B
SOLDER SIDE
SOLDER SIDE
R 3003
R 3001
R 4003
R 4001


FRONT-END
VIEW A
A3009
A3008
A3007
A3006
A3005
A3004
A3003
A3002
A3001
A3000
J3000
P3000
R3088
R3087
R3085
R3086
R3083
R3084
L3002
L3003
L3004
L3005
L3006
C3048
C3049
C3050
C3051
C3052
R3080
R3078
R3081
R3082
C3047
R3077
R3079
R3076
CR3004
R3073
R3074
R3075
C3045
C3046
R3071
R3072
C3040
C3041
C3042
C3043
C3044
R3070
C3039
R3066
R3090
R3068
R3069
R3067
R3063
R3064
R3065
R3057
C3037
R3058
R3059
L3000
R3060
R3061
R3062
R3055
R3056
C3035
C3036
C3034
R3051
R3052
R3053
R3054
C3033
R3050
C3032
P3001
R3043
C3030
R3044
R3049
R3048
C3029
R3037
R3034
R3035
R3038
R3039
R3040
C3026
R3041
R3036
C3021
C3022
R3033
C3025
R3031
R3027
R3032
C3020
R3028
R3029
R3030
R3026
C3019
C3017
R3023
R3022
R3019
R3020
R3024
R3021
C3011
R3017
R3018
C3012
C3013
C3014
R3009
C3007
R3011
C3009
R3013
R3015
C3008
R3014
R3007
R3008
R3001
R3005
R3006
C3002
C3004
R3000
C3005
R3003
R3004
C3006
C3000
C3001

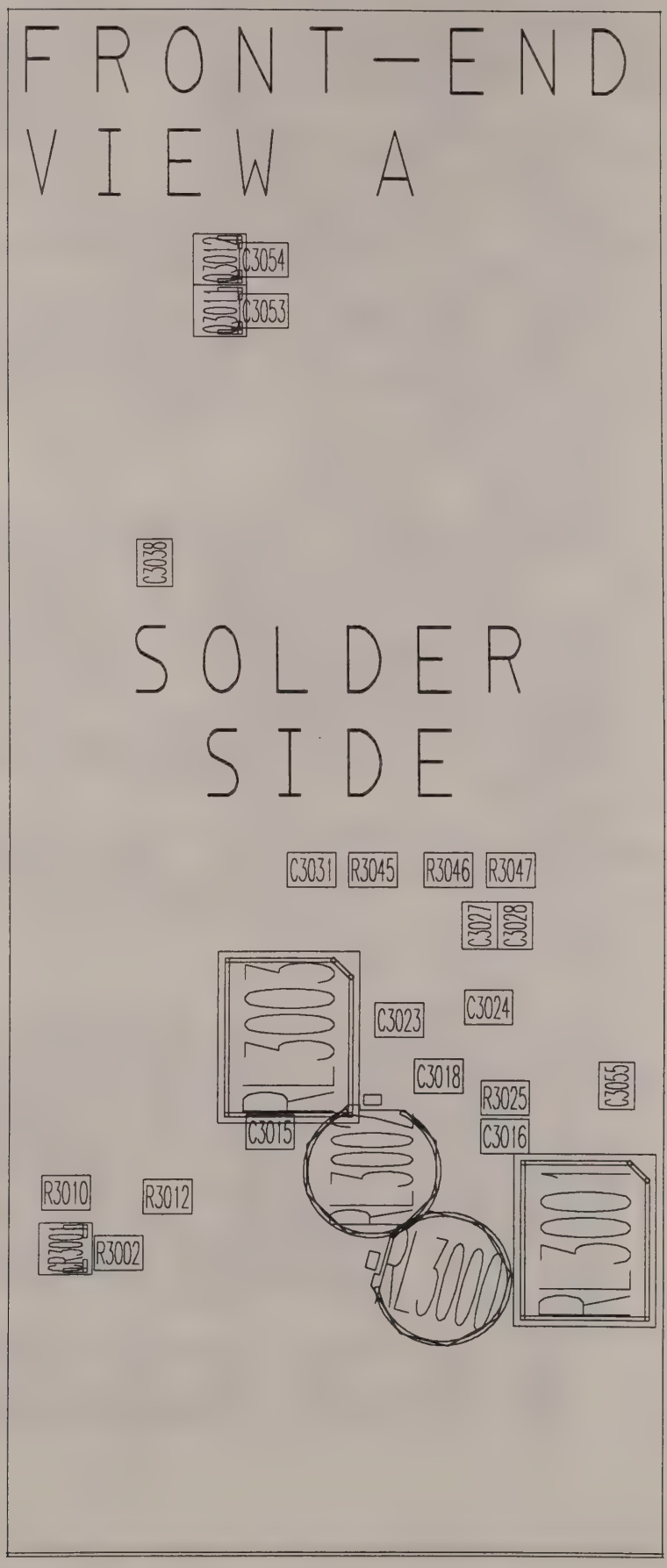
FRONT-END
VIEW A
SM200178002
SM205618594
SM205618594
SM289772003
SM207770201
SM208870339
NOCONN
SM208470358
SM207770403
MFE409
158849009
158849012
BNC-ITI-WR

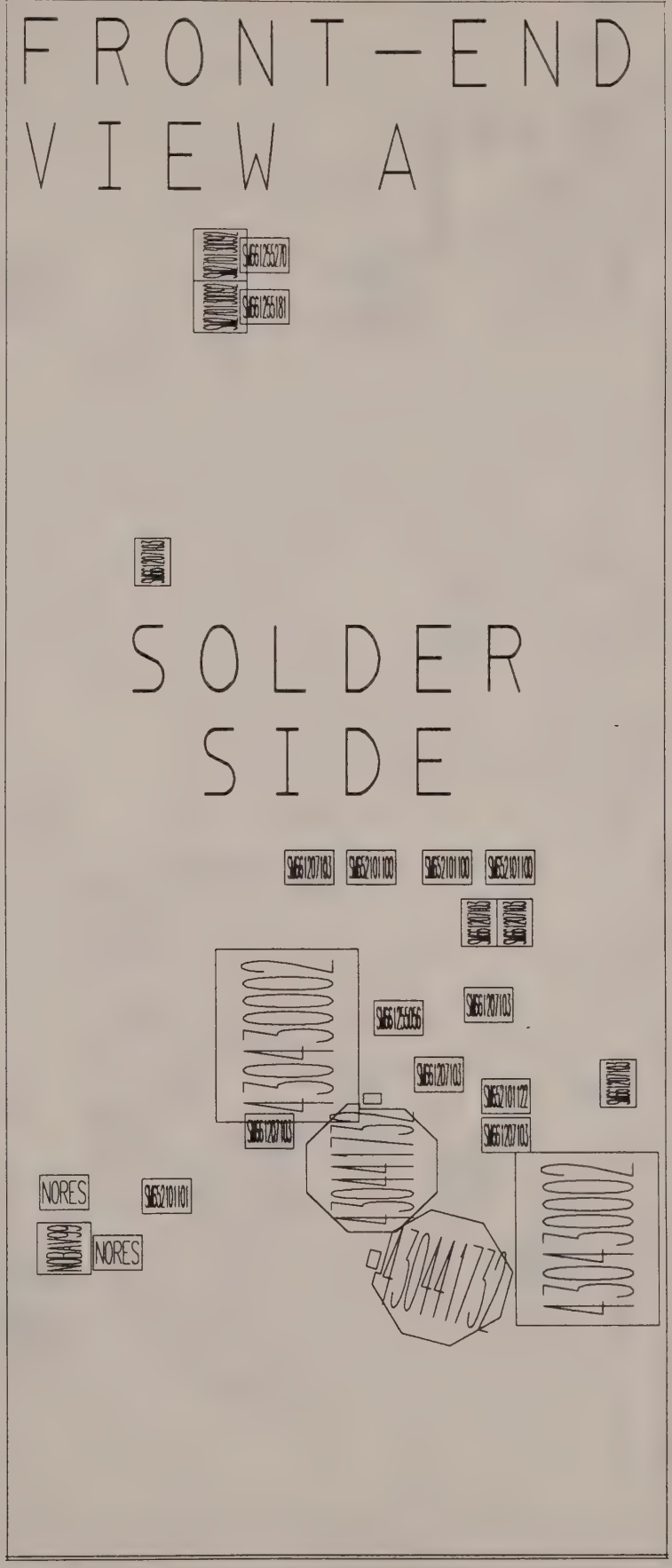

FRONT-END
VIEW A
SM74HCT02-PS
SM74HC594-PS
SM74HC594-PS
SMULN2003
SMDG201-PS
SMLM339
SMLM358
SMDG403-PS
MFE409
SMAD705
BCV62
0.5-2.5pF-S
5-15pF-S
BNC-1T1-WR
NO2x2-RA-M
TZMC5V1
SM100uH
NORES

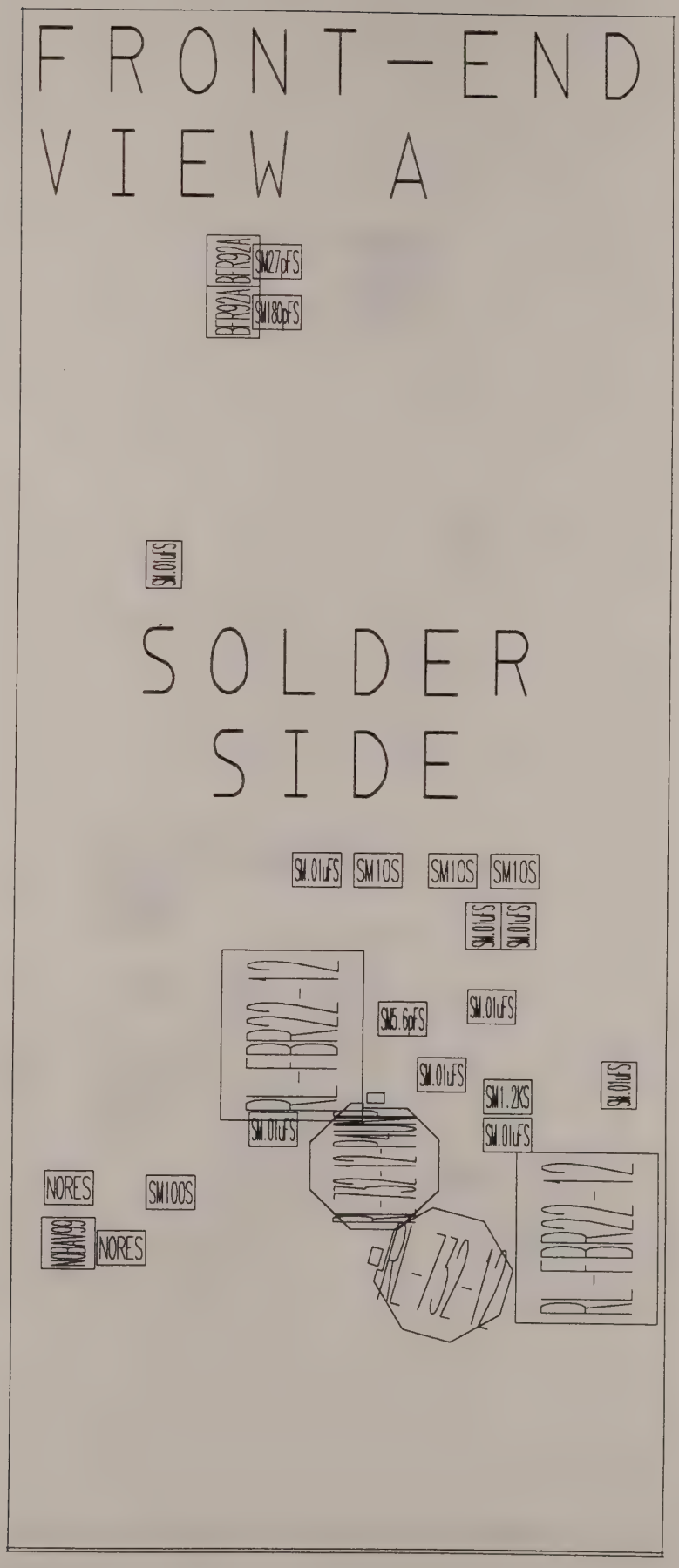

FRONT-END
VIEW B

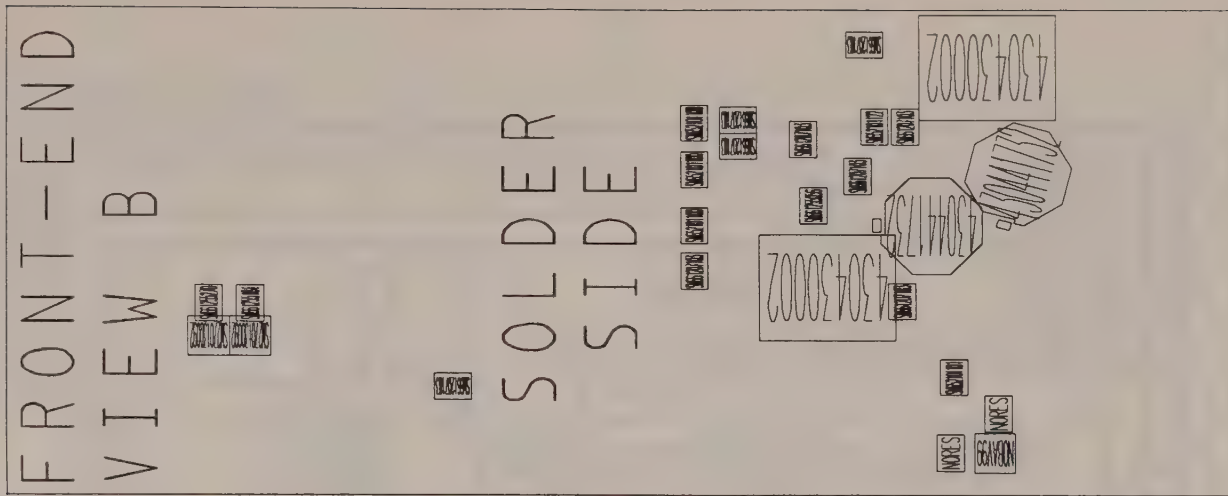

FRONT-END
VIEW B

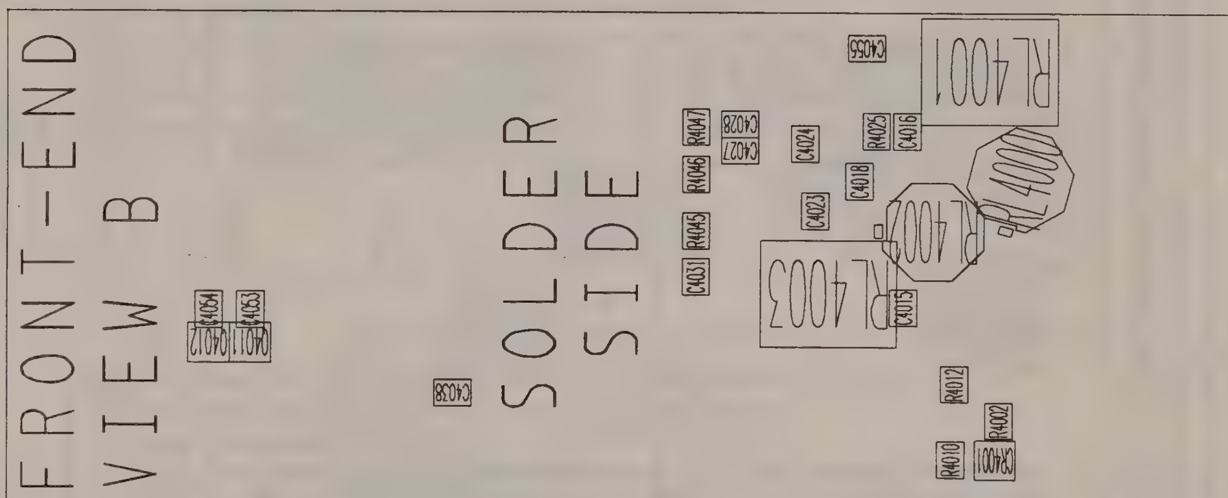
FRONT-END
VIEW B

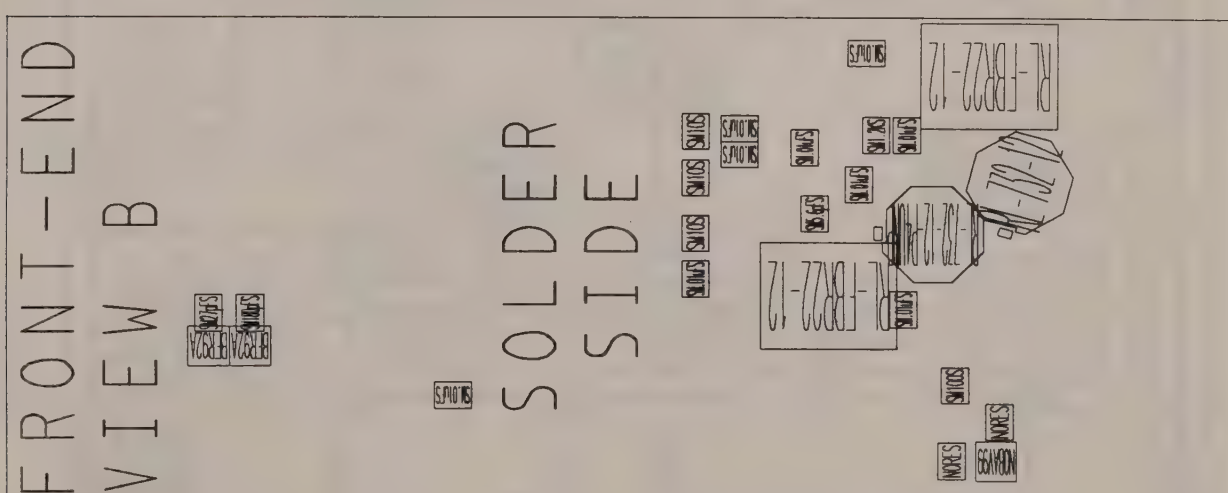

FRONT-END
VIEW A
C3054
C3053
C3038
SOLDER
SIDE
C3031
R3045
R3046
R3047
C3027
C3028
RL3003
C3023
C3024
C3018
R3025
C3055
C3015
C3016
RL3002
RL3001
RL3000
R3010
R3012
R3002

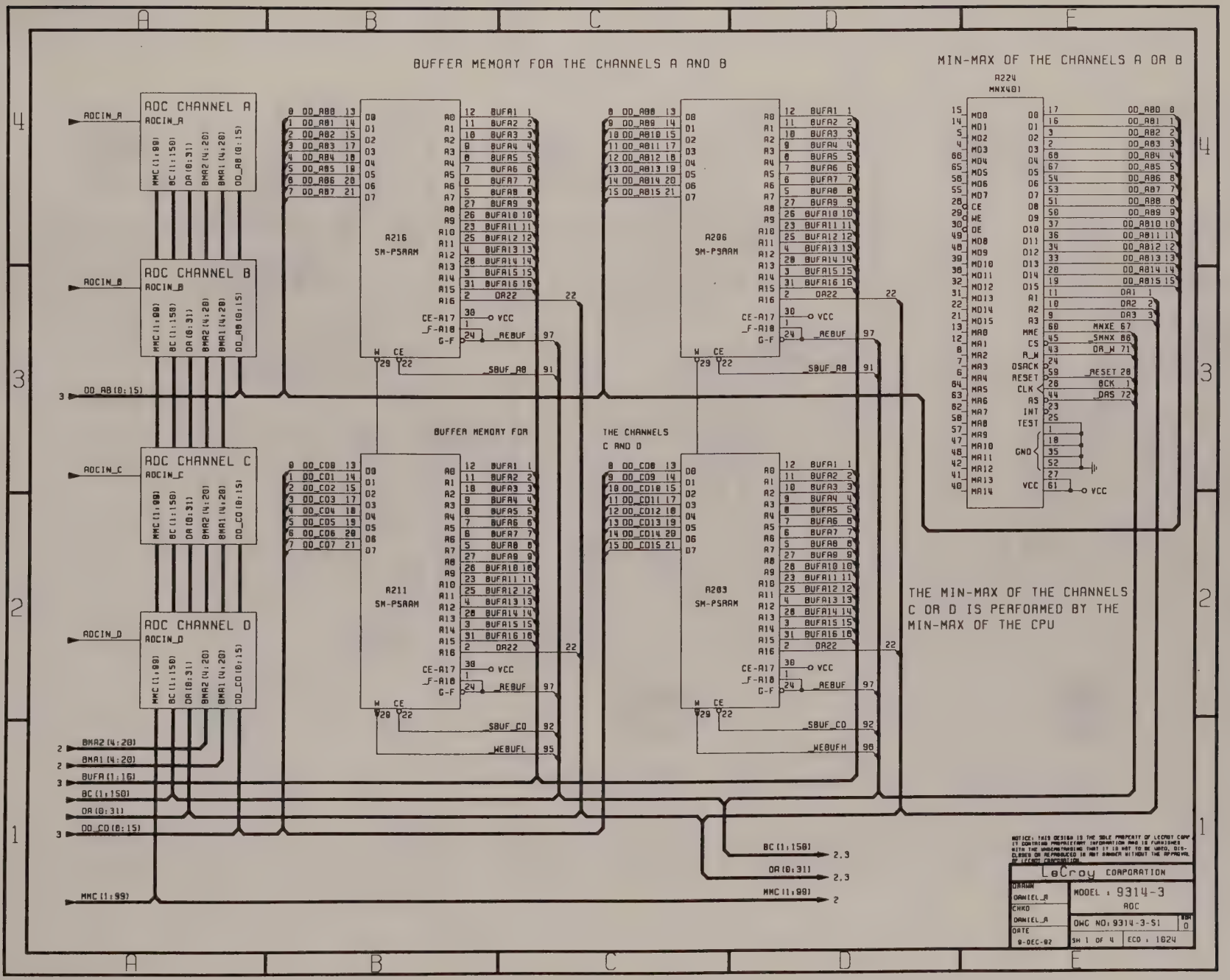

FRONT-END
VIEW A
SOLDER
SIDE
NORES
NORES

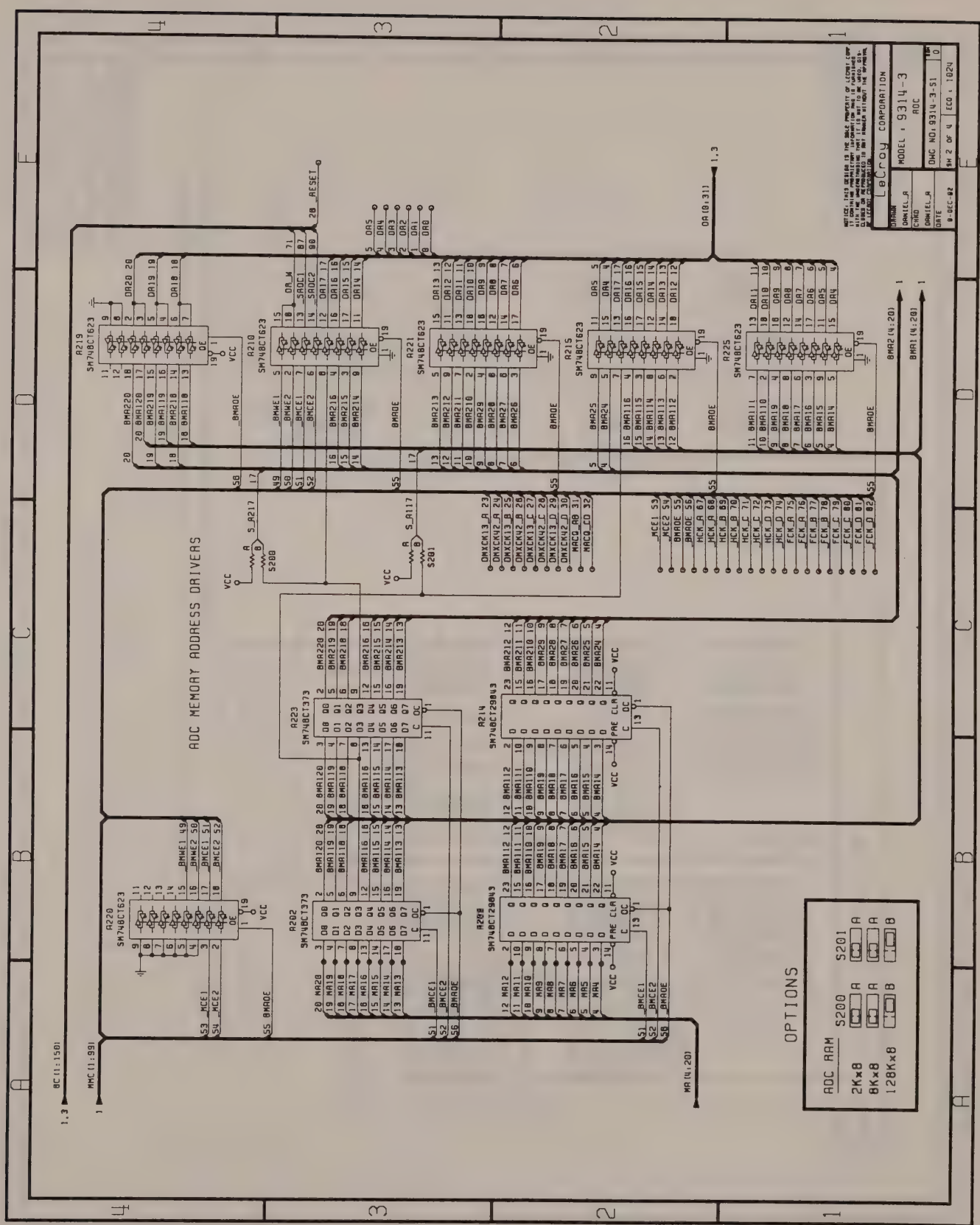

FRONT-END
VIEW A
SM27pFS
SM180pFS
SM.01uFS
SOLDER
SIDE
SM.01uFS
SM10S
SM10S
SM10S
SM10uFS
SM10uFS
SM5.6pFS
SM.01uFS
SM.01uFS
SM1.2KS
SM.01uFS
SM.01uFS
SM.01uFS
NORES
SM100S
NORES

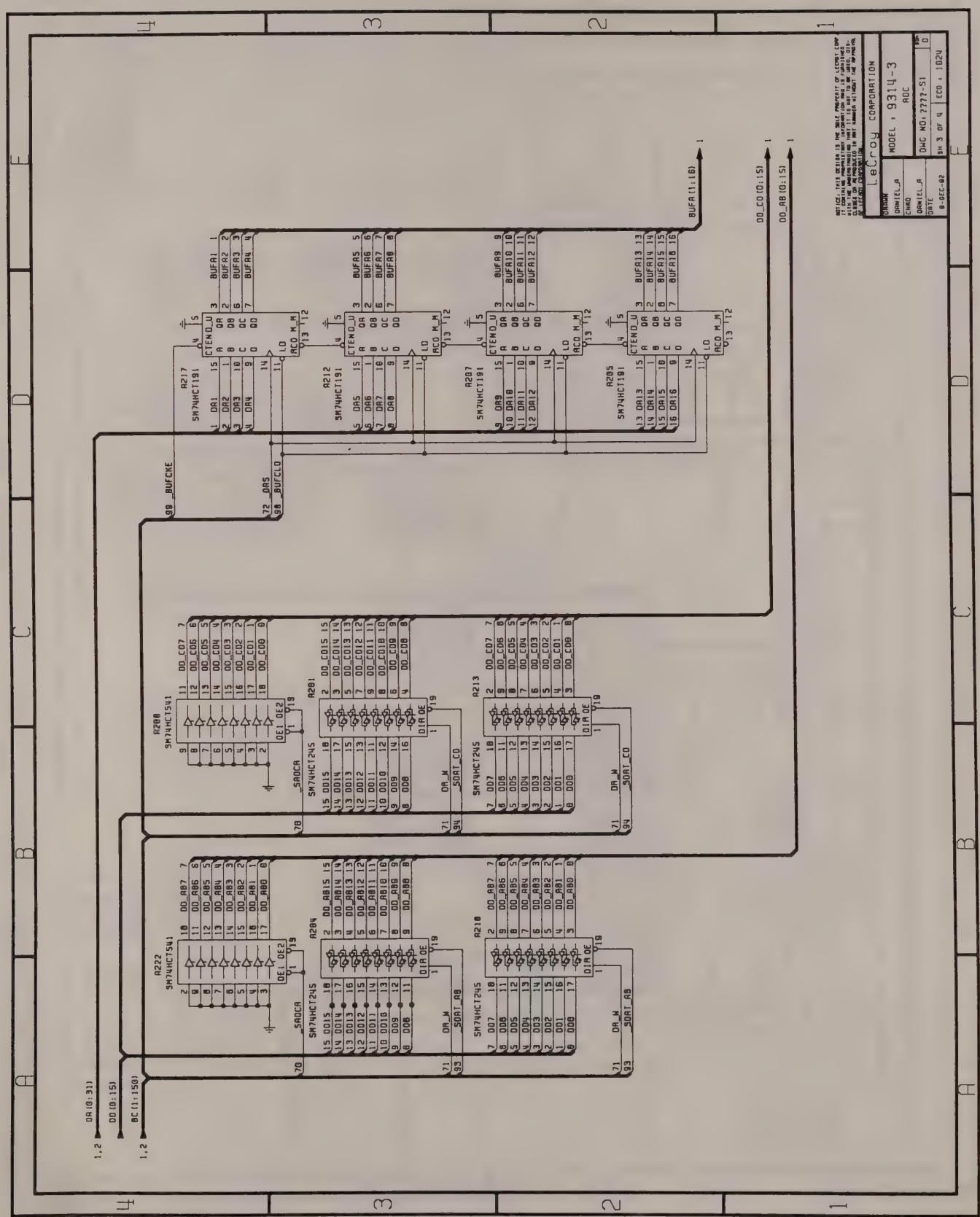

FRONT-END
VIEW B
SOLDER
SIDE

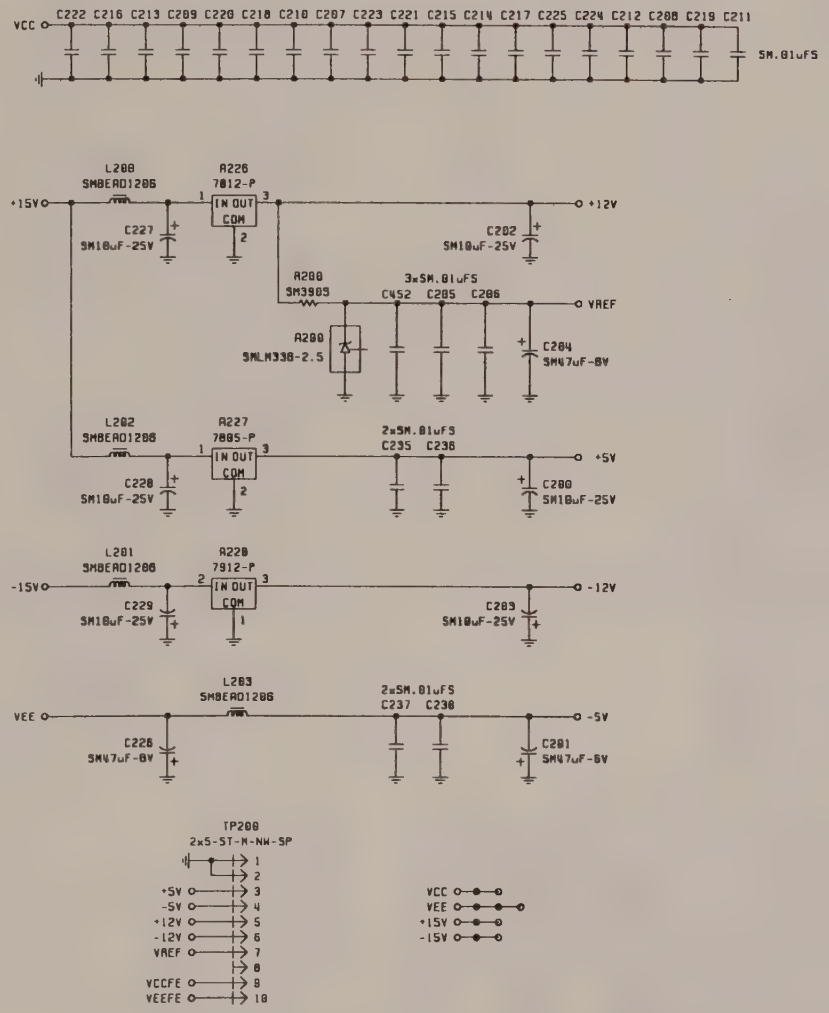

FRONT-END
VIEW B
SOLDER
SIDE
C4055
RL4001
R4047
C4028
C4027
R4025
C4016
C4024
R4046
C4018
RL4000
C4023
RL4002
R4045
C4031
RL4003
C4015
Q4054
Q4053
Q4012
Q4011
C4038
R4012
R4002
R4010
CR4001


FRONT-END
VIEW B
SOLDER
SIDE


BUFFER MEMORY FOR THE CHANNELS A AND B
MIN-MAX OF THE CHANNELS A OR B
ADC CHANNEL A
ADC CHANNEL B
ADC CHANNEL C
ADC CHANNEL D
A216
SM-PSRAM
A206
SM-PSRAM
A211
SM-PSRAM
A203
SM-PSRAM
A224
MNX401
BUFFER MEMORY FOR THE CHANNELS C AND D
THE MIN-MAX OF THE CHANNELS C OR D IS PERFORMED BY THE MIN-MAX OF THE CPU
LeCroy CORPORATION
MODEL : 9314-3
ADC
DWG NO: 9314-3-S1
SH 1 OF 4
ECO : 1824
DRAWN DANIEL_R
CHKD DANIEL_R
DATE 8-DEC-92


ADC MEMORY ADDRESS DRIVERS
OPTIONS
ADC RAM
2Kx8
8Kx8
128Kx8
S200
S201
LeCroy CORPORATION
MODEL : 9314-3
ADC
DWG NO: 9314-3-S1
SH 2 OF 4
ECO : 1024
9-DEC-82


LeCroy CORPORATION
MODEL : 9314-3
ADC
DWG NO: 2722-51
SH 3 OF 4
ECO : 1024
DRAWN DANIEL_A
CHKD DANIEL_A
DATE 8-DEC-92
A217 SM74HCT191
A212 SM74HCT191
A207 SM74HCT191
A205 SM74HCT191
A208 SM74HCT541
A222 SM74HCT541
A201 SM74HCT245
A204 SM74HCT245
A213 SM74HCT245
A210 SM74HCT245
BUFA(1:16)
DD_CD(0:15)
DD_AB(0:15)
DA(0:31)
DD(0:15)
BC(1:150)



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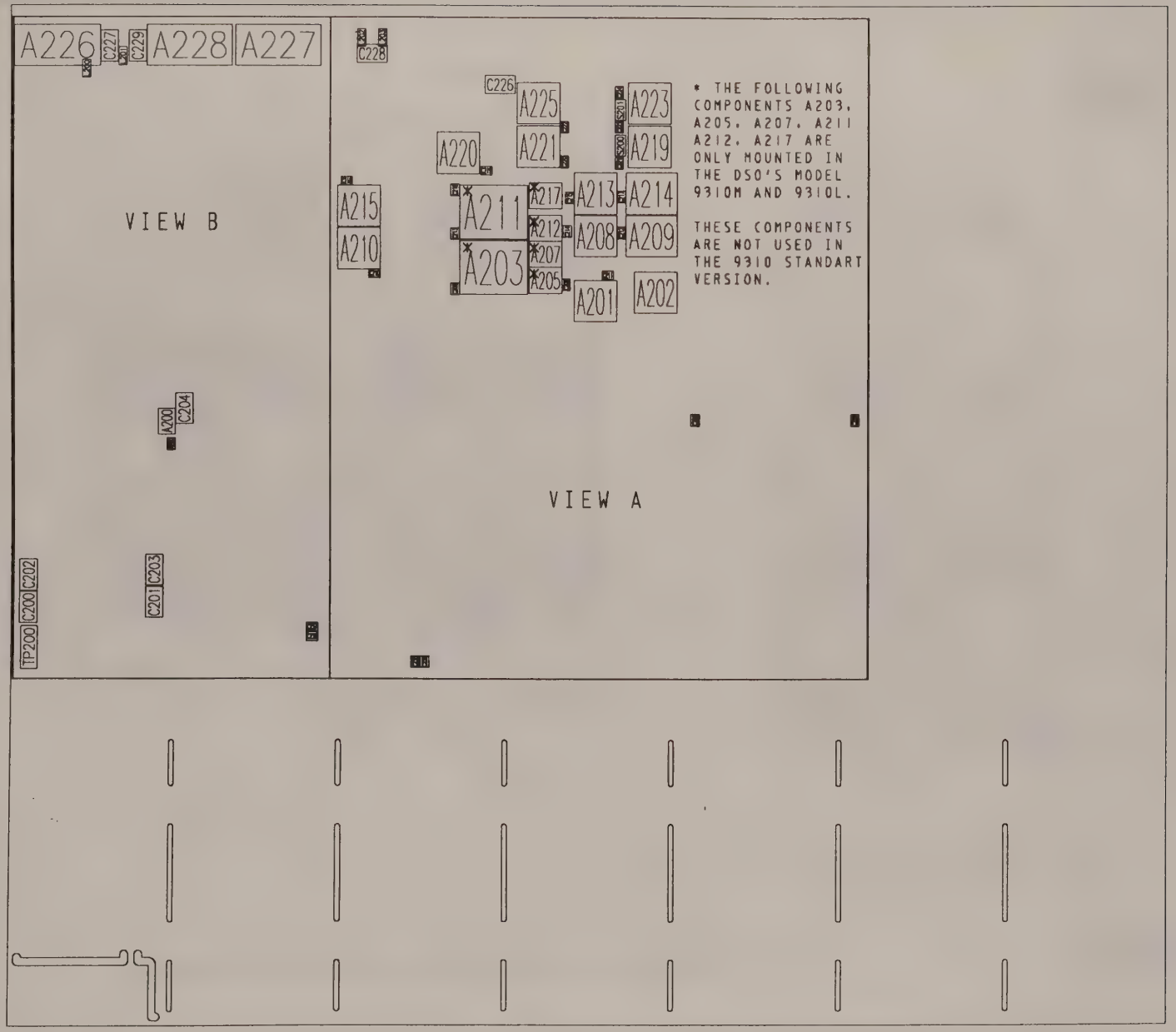
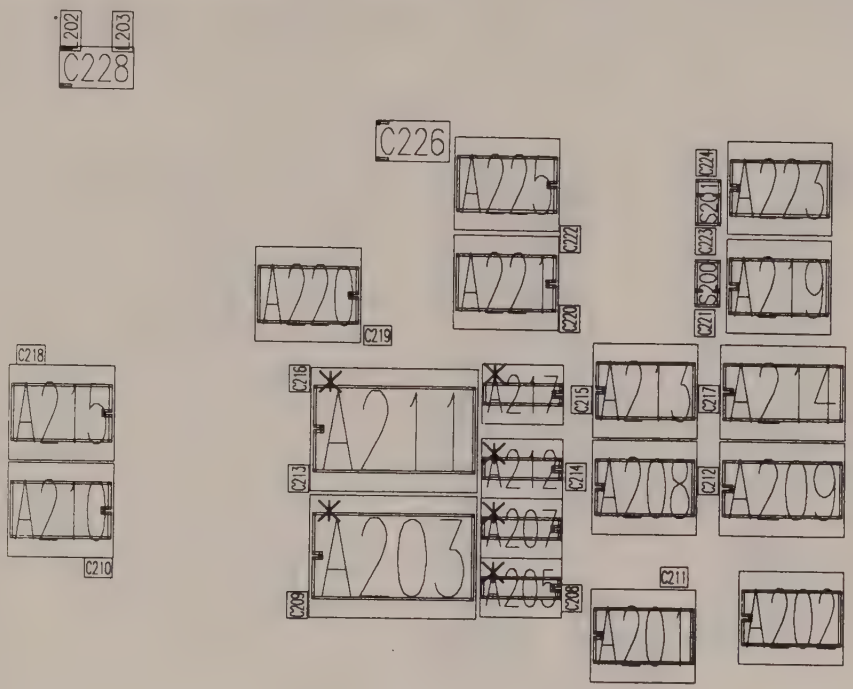
LeCroy CORPORATION

DRAWN DANIEL_R	MODEL : 9314-3 ADC
CHKD DANIEL_R	DWG NO: 2222-51 REV 0
DATE 8-DEC-82	SH 4 OF 4 ECO : 1024

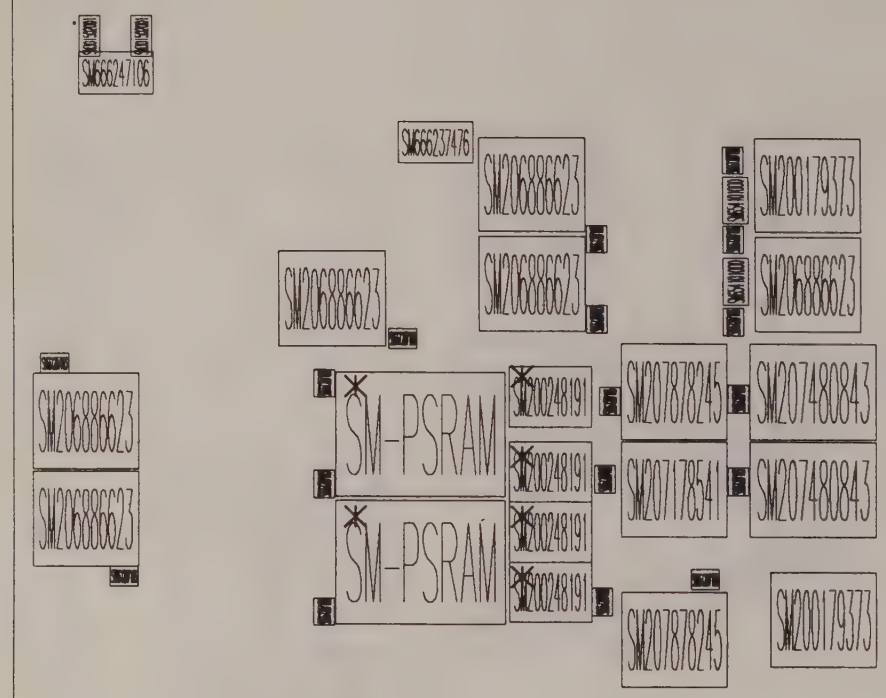

A226
C227
C230
C229
A228
A227
C228
C226
A225
A223
A221
A219
A220
A215
A211
A217
A213
A214
A212
A208
A209
A210
A203
A207
A205
A201
A202
* THE FOLLOWING COMPONENTS A203, A205, A207, A211 A212, A217 ARE ONLY MOUNTED IN THE DSO'S MODEL 9310M AND 9310L.
THESE COMPONENTS ARE NOT USED IN THE 9310 STANDART VERSION.
VIEW B
VIEW A
A200
C204
C201
C203
TP200
C200
C202
ADC CONTROL



* THE FOLLOWING COMPONENTS A203, A205, A207, A211 A212, A217 ARE ONLY MOUNTED IN THE DSO'S MODEL 9310M AND 9310L.

THESE COMPONENTS ARE NOT USED IN THE 9310 STANDART VERSION.

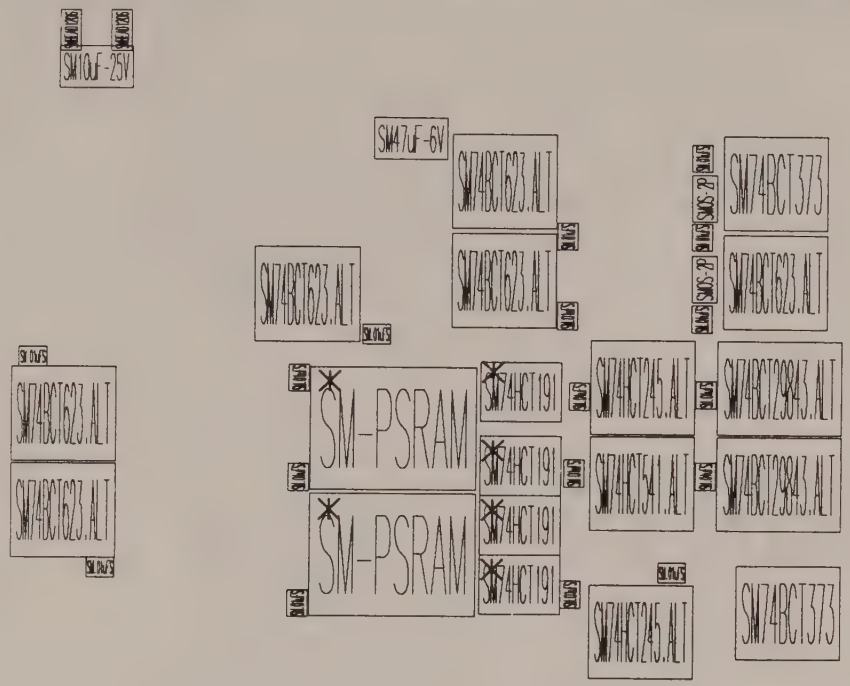
ADC CONTROL VIEW A



* THE FOLLOWING COMPONENTS A203, A205, A207, A211 A212, A217 ARE ONLY MOUNTED IN THE DSO'S MODEL 9310M AND 9310L.

THESE COMPONENTS ARE NOT USED IN THE 9310 STANDART VERSION.

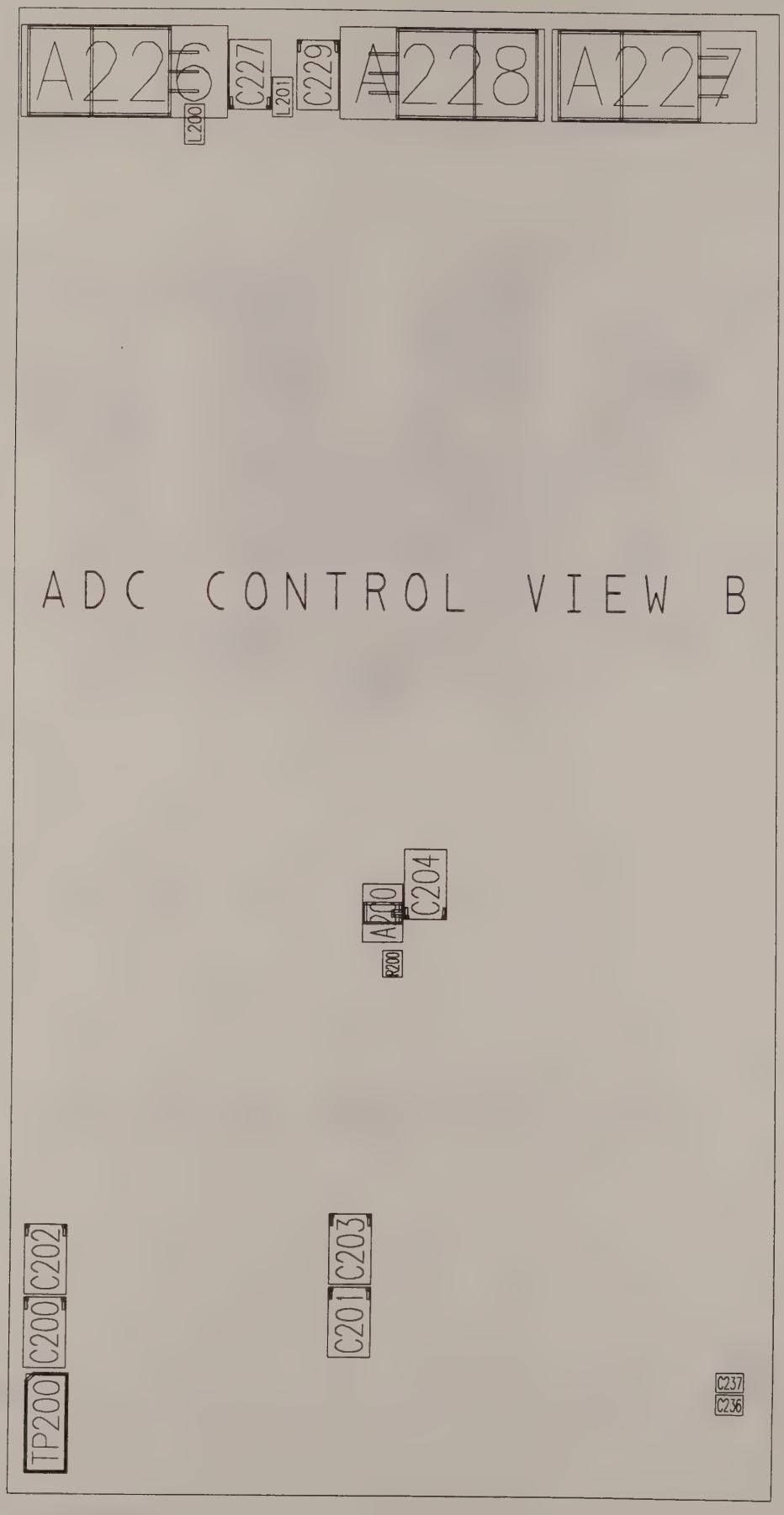
ADC CONTROL VIEW A

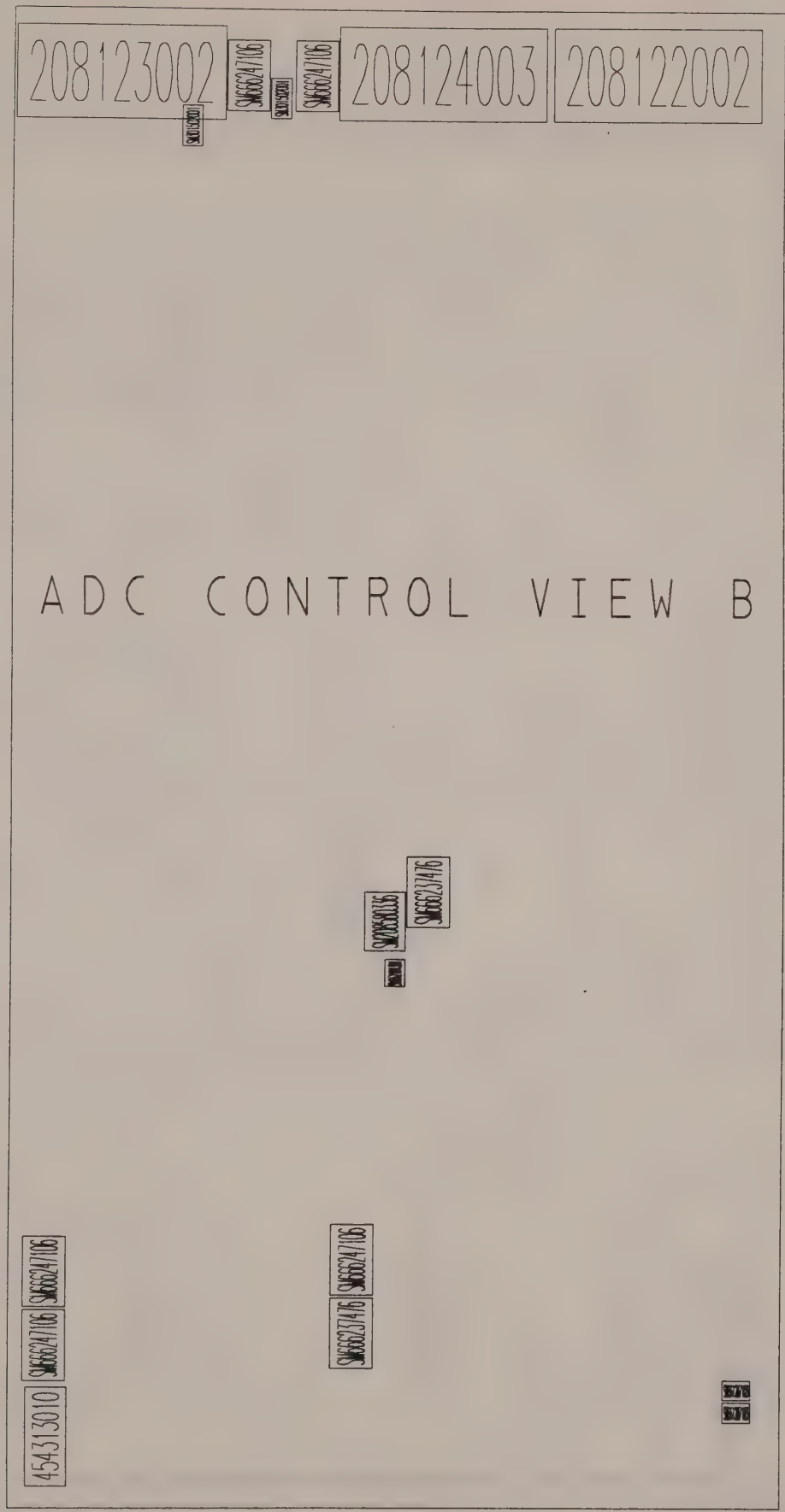


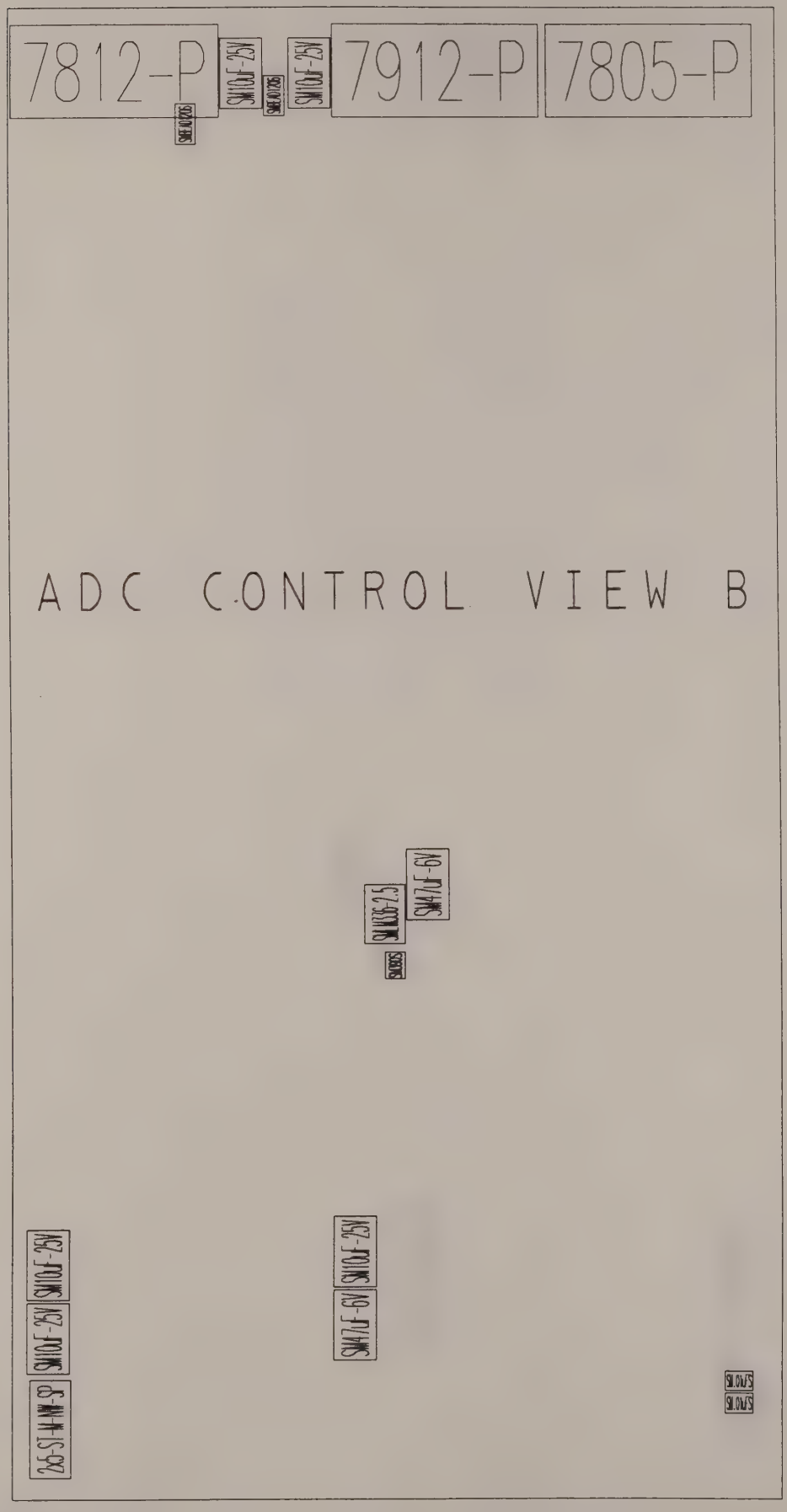
* THE FOLLOWING COMPONENTS A203, A205, A207, A211 A212, A217 ARE ONLY MOUNTED IN THE DSO'S MODEL 9310M AND 9310L.

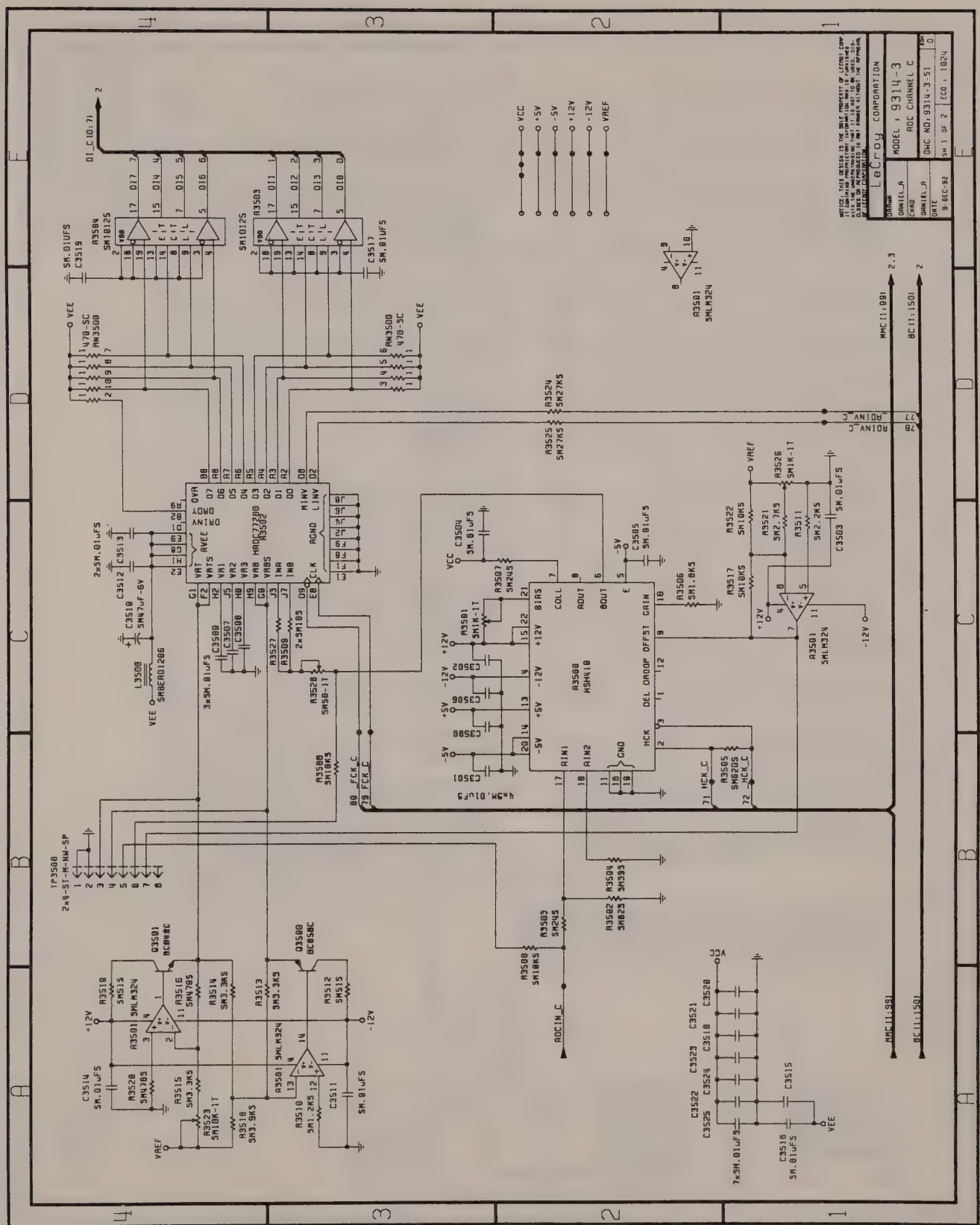
THESE COMPONENTS ARE NOT USED IN THE 9310 STANDART VERSION.

ADC CONTROL VIEW A


A226
A227
A228
L200
C227
L201
C229
ADC CONTROL VIEW B
A210
C204
R200
C201
C203
C200
C202
TP200
C237
C236


208123002
208124003
208122002
ADC CONTROL VIEW B
454313010


7812-P
7912-P
7805-P
ADC CONTROL VIEW B


LeCroy CORPORATION
MODEL : 9314-3
ADC CHANNEL C
DWG NO: 9314-3-S1
DRAWN DANIEL_A
CHKD
DATE 9-DEC-92
SH 1 OF 2
ECO : 1024
D1_C[0:7]
ADIN_C
ADCIN_C
FCK_C
HCK_C
VCC
+5V
-5V
+12V
-12V
VREF
VEE
A3501 SML324
A3502 HDAC12208
A3504 SM10125
A3508 HSHA10
A3509 SM2K5
A3510 SM1.2K5
A3511 SM2.2K5
A3512 SM51S
A3513 SM3.3K5
A3514 SM3.3K5
A3515 SM3.3K5
A3516 SM470S
A3517 SM10K5
A3518 SM51S
A3521 SM2.7K5
A3522 SM10K5
A3523 SM10K-1T
A3524 SM27K5
A3525 SM27K5
A3526 SM1K-1T
A3527 SM10K5
A3528 SM50-1T
A3529 SM10K5
A3530 SM10K5
A3531 SM10K-1T
A3532 SM10K5
A3533 SM10K5
A3534 SM10K5
A3535 SM20S
A3536 SM1.8K5
A3537 SM10K5
A3538 SM10K5
A3539 SM10K5
A3540 SM10K5
A3541 SM10K5
A3542 SM10K5
A3543 SM10K5
A3544 SM10K5
A3545 SM10K5
A3546 SM10K5
A3547 SM10K5
A3548 SM10K5
A3549 SM10K5
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A3591 SM10K5
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A3596 SM10K5
A3597 SM10K5
A3598 SM10K5
A3599 SM10K5
A3600 SM10K5
A3601 SM10K5
A3602 SM10K5
A3603 SM10K5
A3604 SM10K5
A3605 SM10K5
A3606 SM10K5
A3607 SM10K5
A3608 SM10K5
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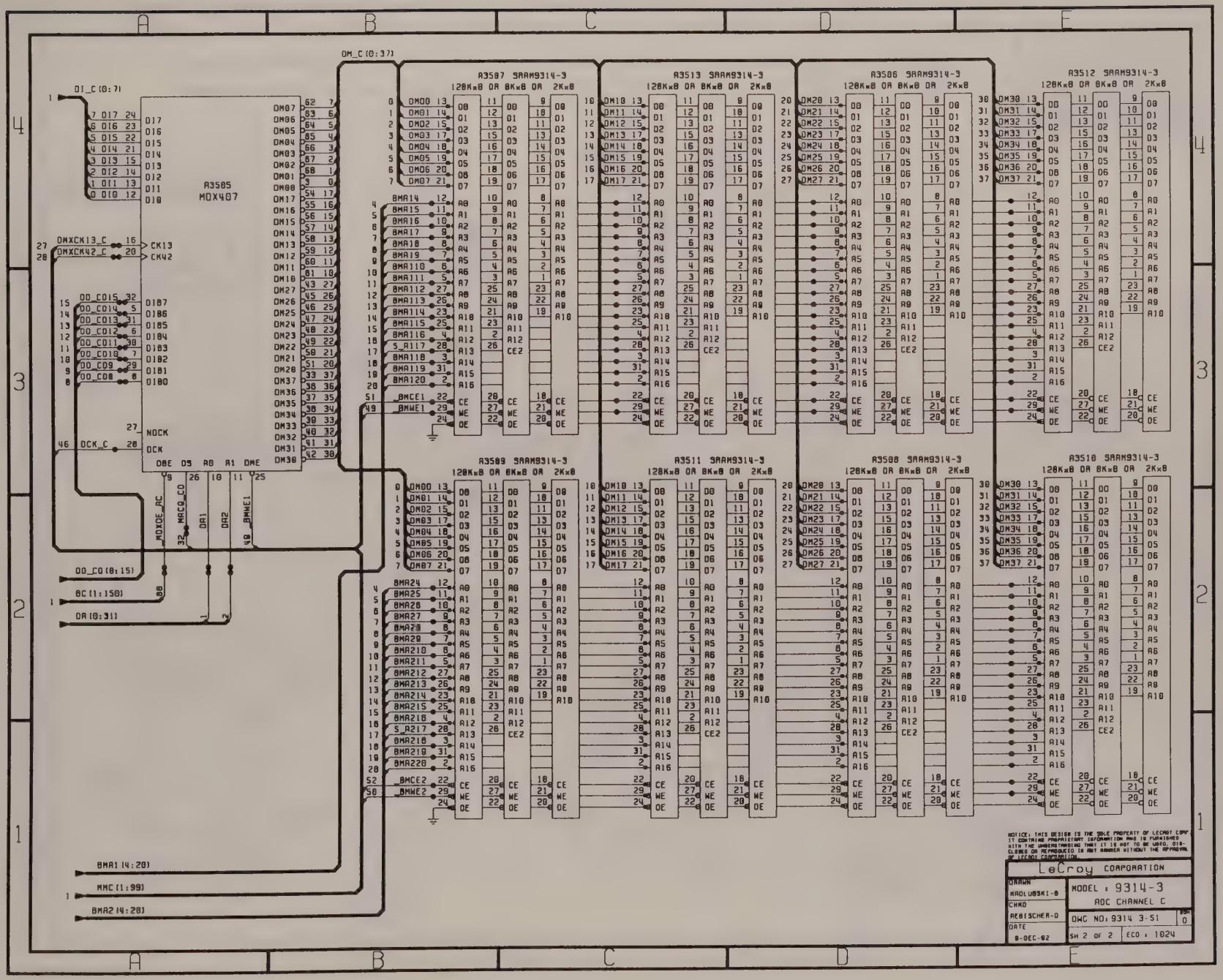
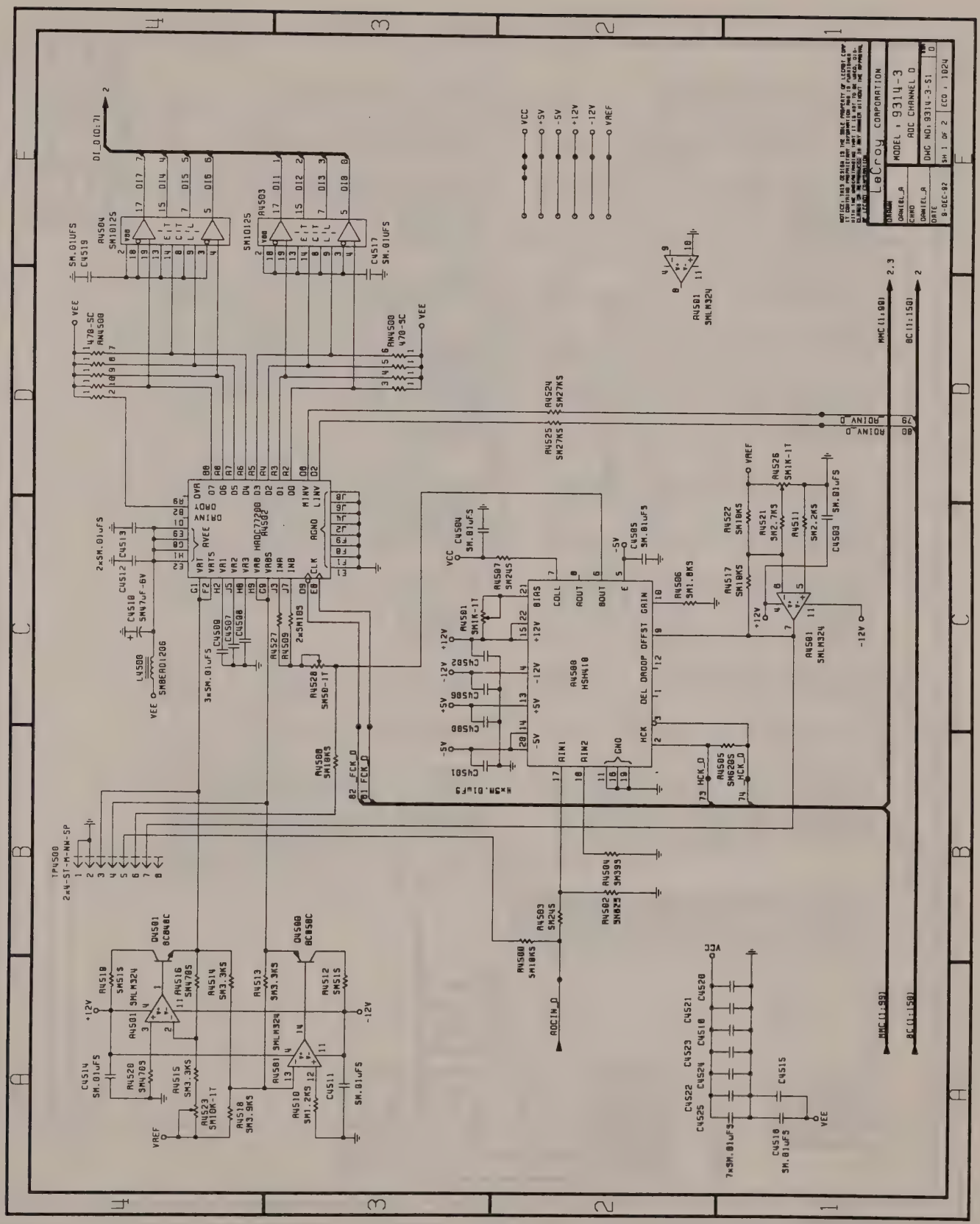
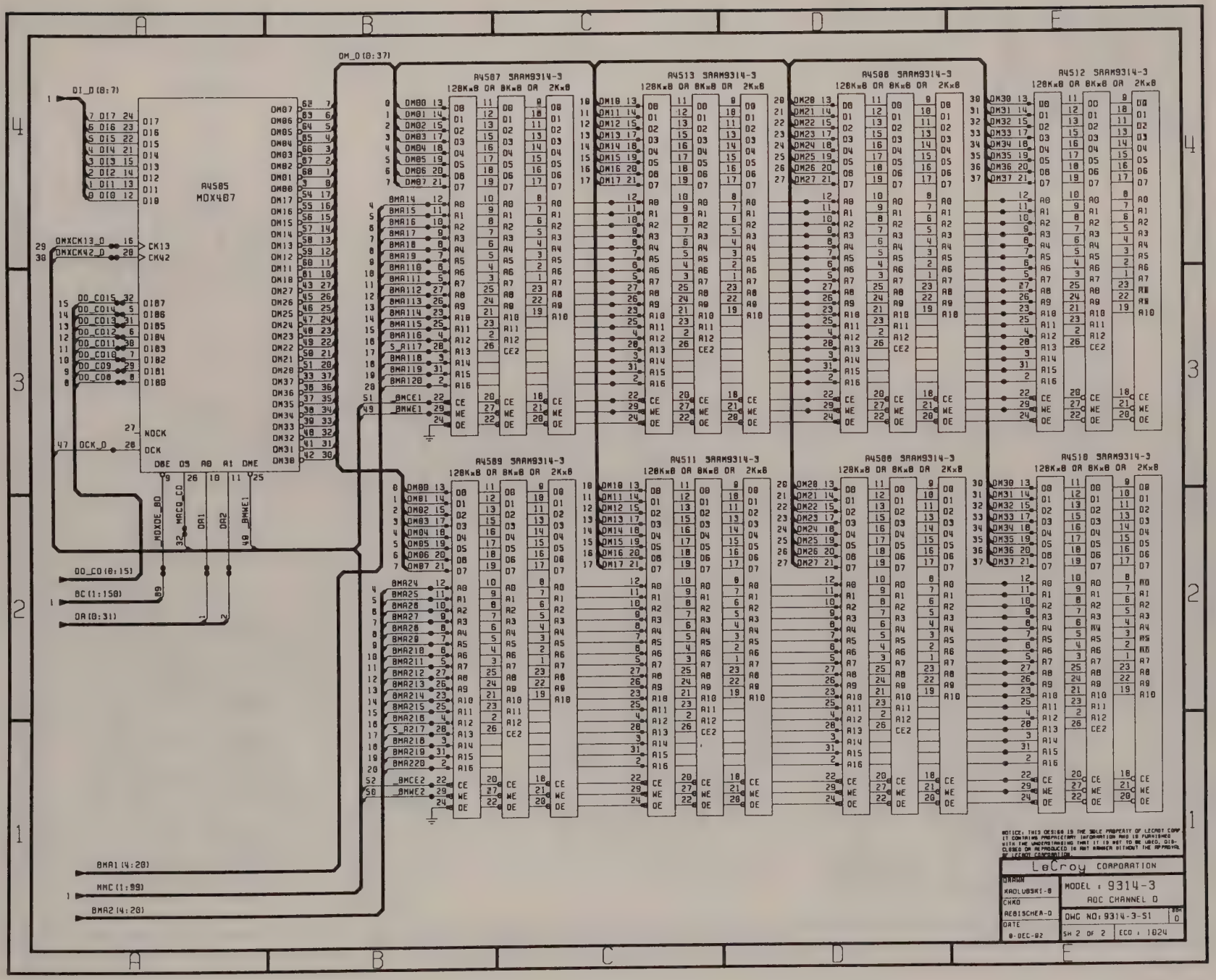
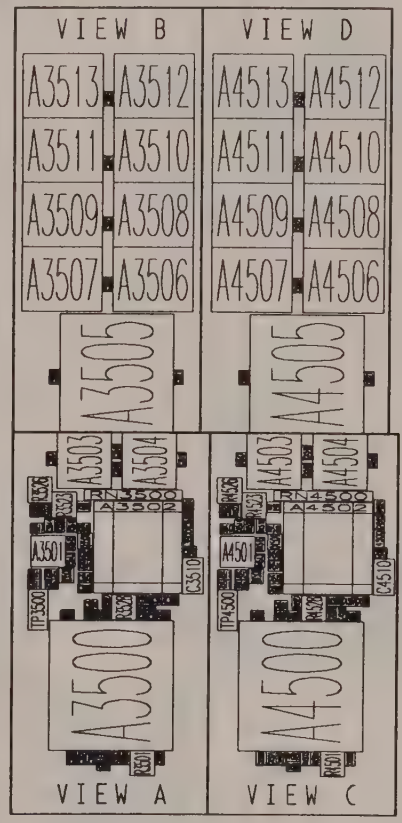

A3585
MOX407
A3587 SRAM9314-3
A3513 SRAM9314-3
A3586 SRAM9314-3
A3512 SRAM9314-3
A3589 SRAM9314-3
A3511 SRAM9314-3
A3588 SRAM9314-3
A3510 SRAM9314-3
128Kx8 OR 8Kx8 OR 2Kx8
DM_C(0:37)
DI_C(0:7)
BMA(14:20)
MMC(1:99)
BMA2(4:20)
DO_CO(8:15)
BC(1:158)
DA(0:31)
LeCroy CORPORATION
DRAWN
KADLUBSKI-B
CHKD
REBISCHER-D
DATE
8-DEC-82
MODEL : 9314-3
ADC CHANNEL C
DWG NO: 9314 3-S1
REV 0
SH 2 OF 2
ECO : 1024




A4585 MOX487
A4587 SRAM9314-3
A4513 SRAM9314-3
A4588 SRAM9314-3
A4512 SRAM9314-3
A4589 SRAM9314-3
A4511 SRAM9314-3
A4588 SRAM9314-3
A4510 SRAM9314-3
128Kx8 OR 8Kx8 OR 2Kx8
DI_D(8:7)
OM_D(8:37)
DO_CO(8:15)
BC(1:158)
DA(8:31)
BMA1(4:20)
MMC(1:99)
BMA2(4:20)
LeCroy CORPORATION
MODEL : 9314-3
ADC CHANNEL D
DWG NO: 9314-3-S1
SH 2 OF 2
ECO : 1024

MODEL :	AX506 TO AX513 OR SRAM9314-3
9310	2K X8 SM205210128
9310M	8K X8 SM205219264
9310L	128K X8 SM205701070



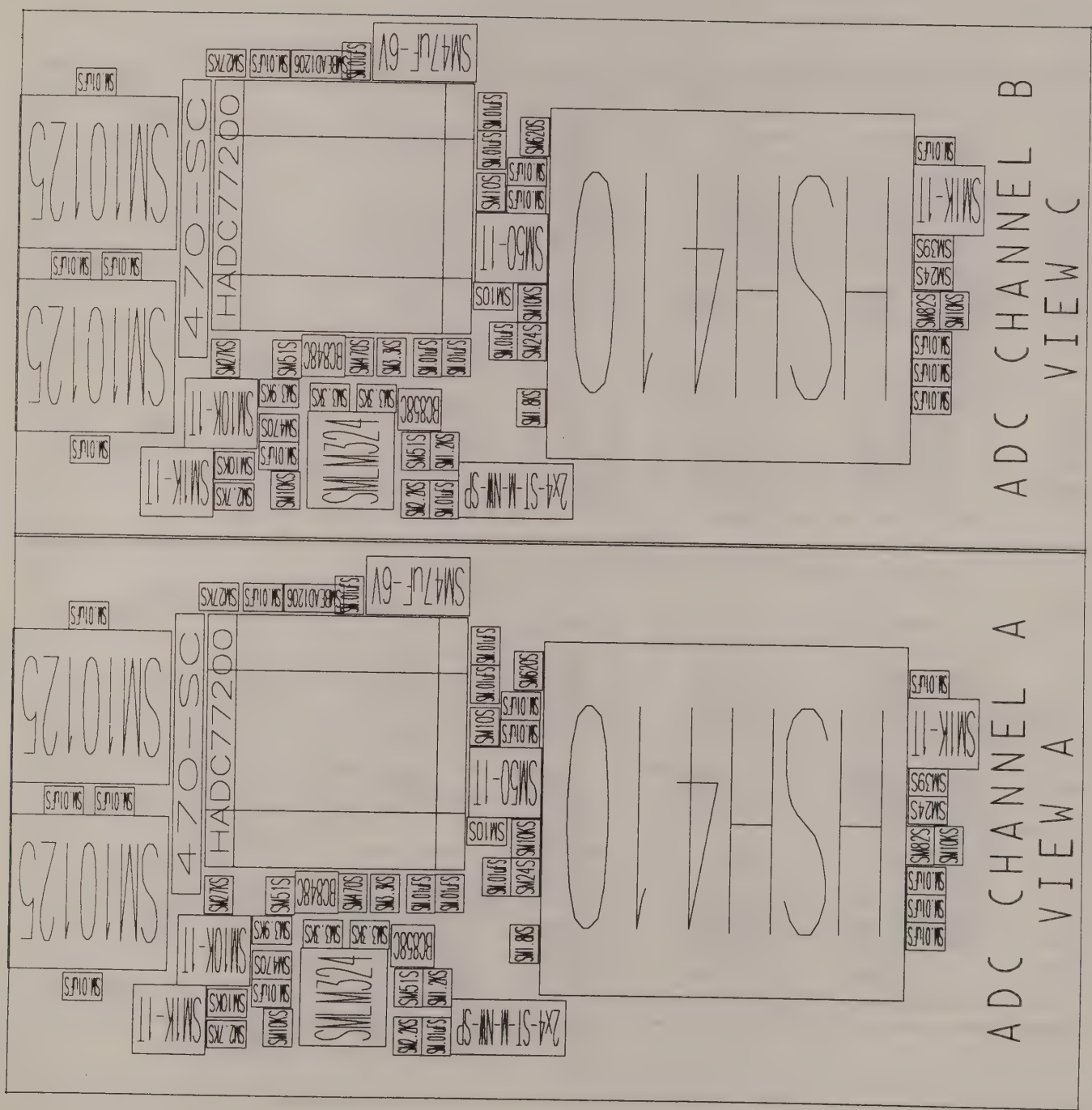
ADC CHANNEL'S A & B

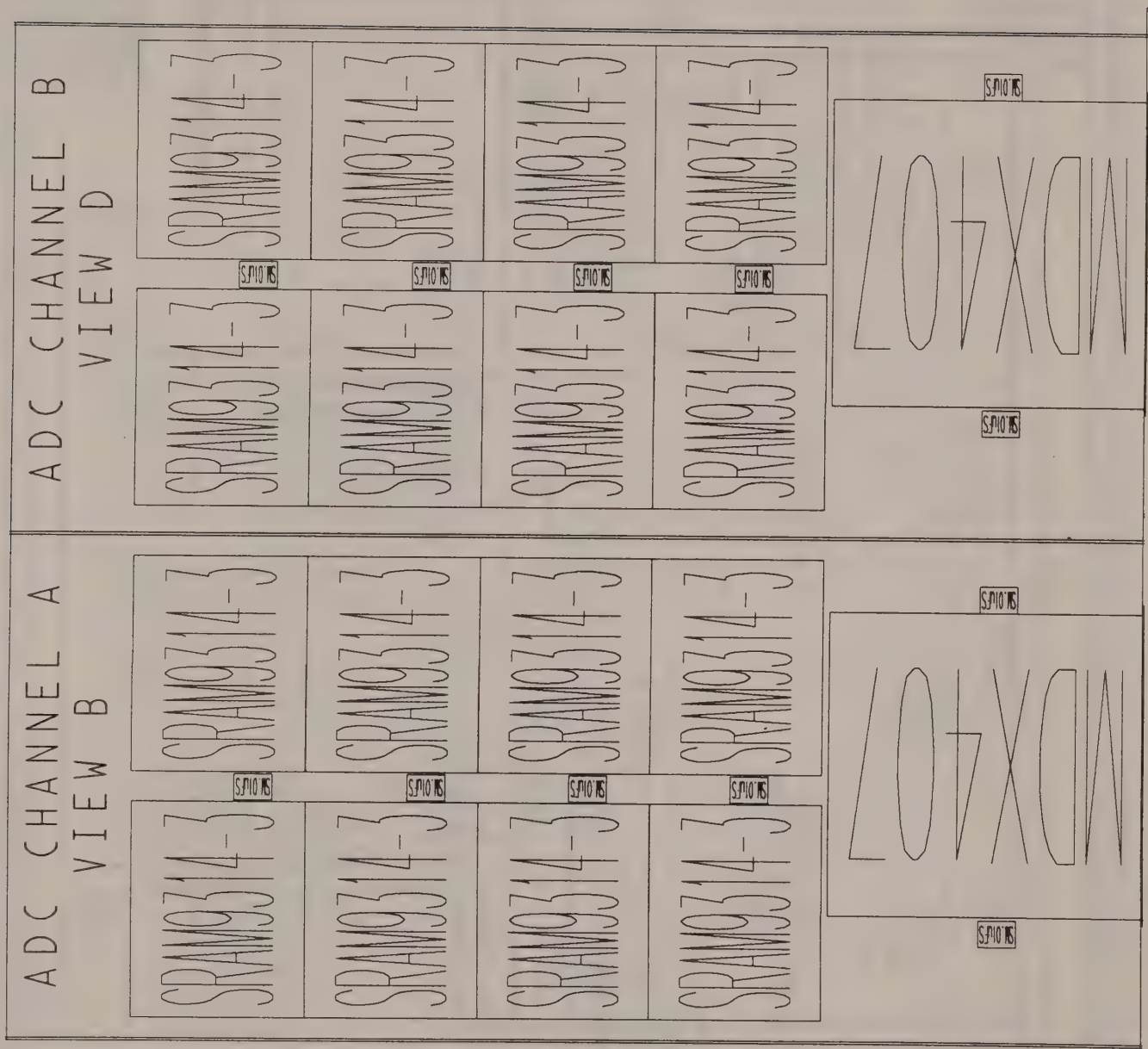
ADC CHANNEL B
VIEW C
ADC CHANNEL A
VIEW A

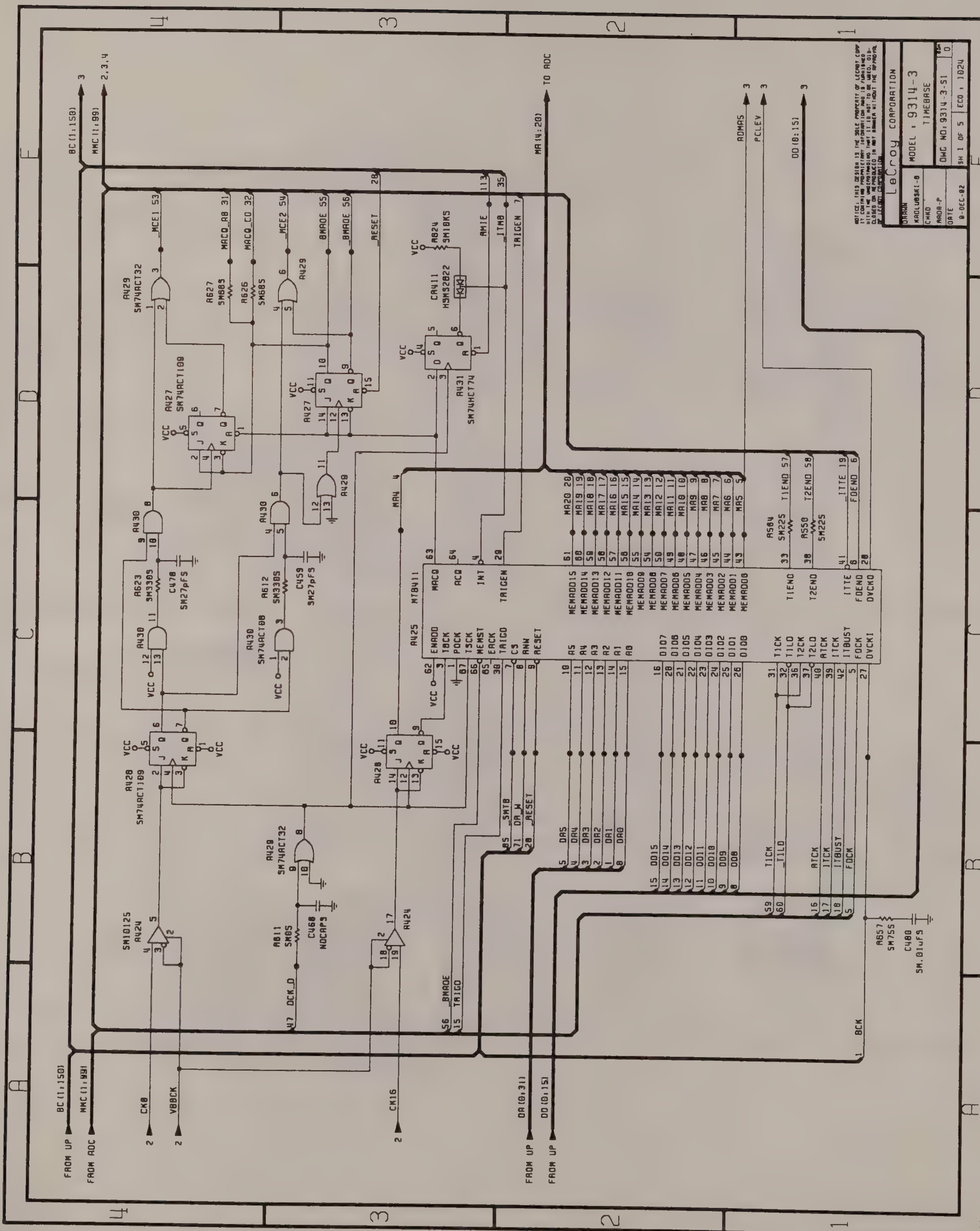
ADC CHANNEL A
VIEW B
A3517A3512
A3511A3510
A3509A3508
A3507A3506
C3525
C3524
C3523
C3522
C3520
C3521
ADC CHANNEL B
VIEW D
A4517A4512
A4511A4510
A4509A4508
A4507A4506
C4525
C4524
C4523
C4522
C4520
C4521

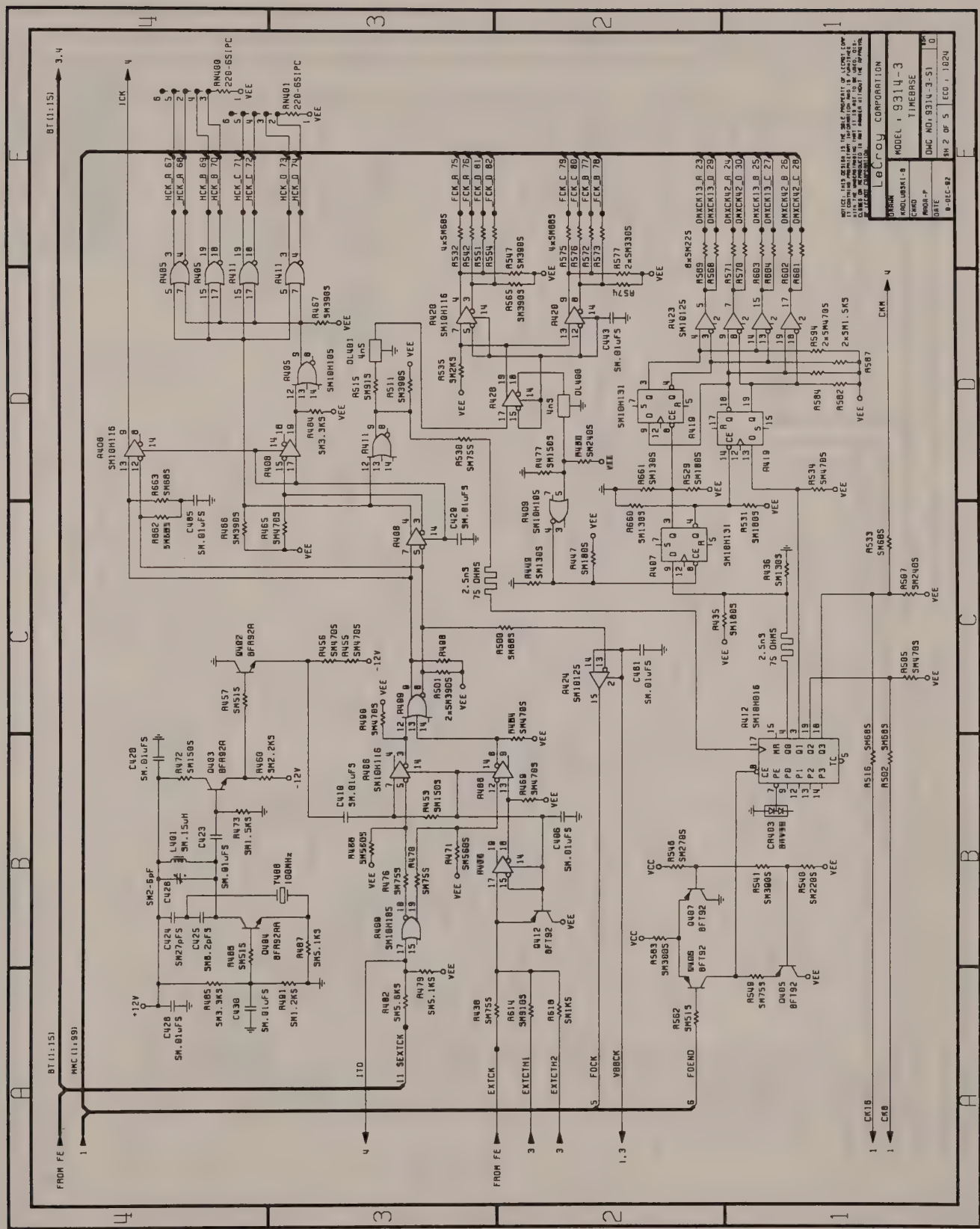
ADC CHANNEL B
VIEW C
ADC CHANNEL A
VIEW A

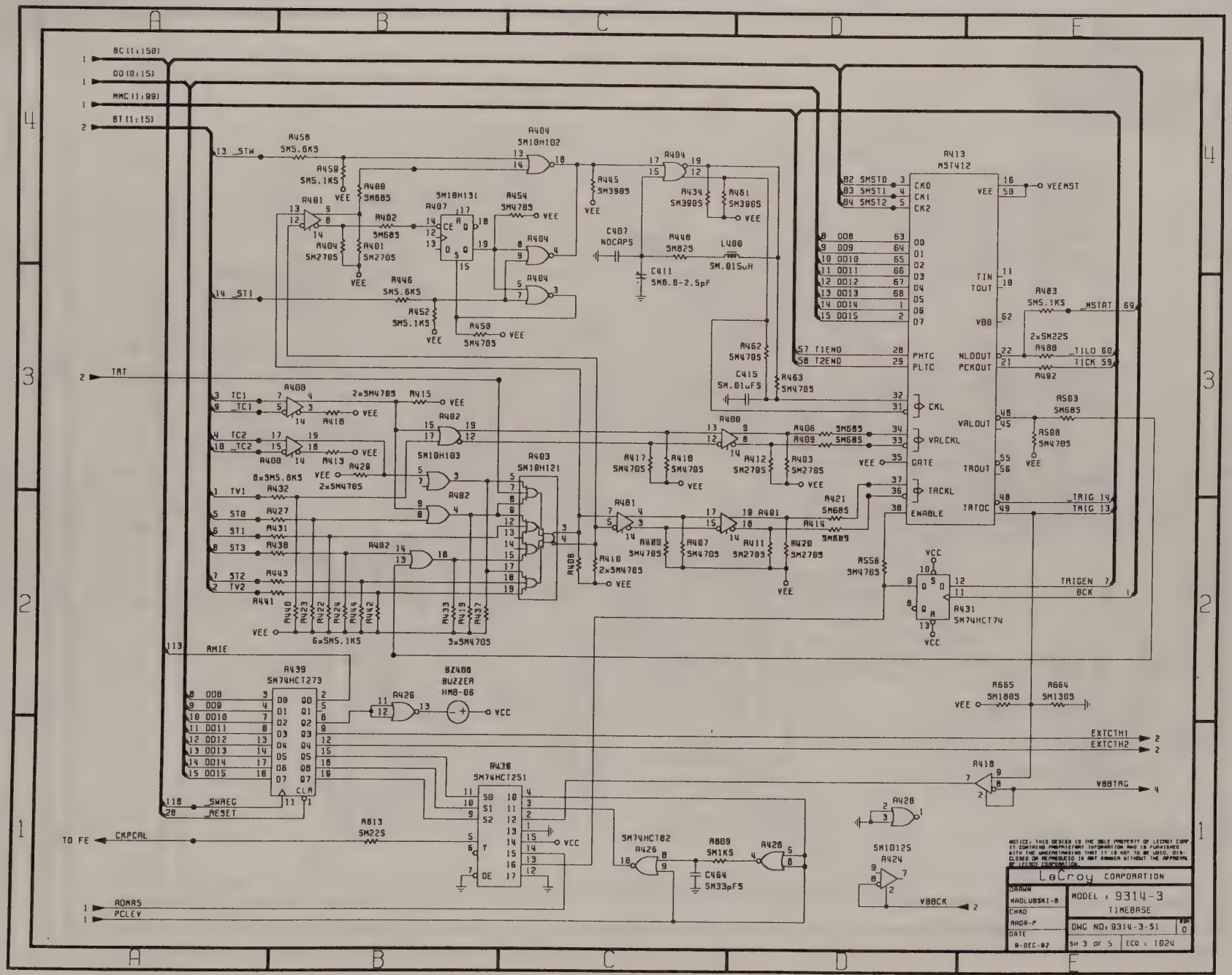
ADC CHANNEL A
VIEW B
SRAM9314-3
SRAM9314-3
SRAM9314-3
SRAM9314-3
SRAM9314-3
SRAM9314-3
SRAM9314-3
SRAM9314-3
MUX407
ADC CHANNEL B
VIEW D
SRAM9314-3
SRAM9314-3
SRAM9314-3
SRAM9314-3
SRAM9314-3
SRAM9314-3
SRAM9314-3
SRAM9314-3
MUX407


ADC CHANNEL B
VIEW C
ADC CHANNEL A
VIEW A
470-SC
HADC77200
SM10125
SM10125
SM47uF-6V
SM50-1T
SM10K-1T
SM1K-1T
SMLM324
2x4-ST-M-NW-SP
HSH410


ADC CHANNEL B
VIEW D
ADC CHANNEL A
VIEW B
SRAM9314-3
MDX407


LeCroy CORPORATION
MODEL : 9314-3
TIMEBASE
DWG NO. 9314-3-S1


LeCroy CORPORATION
MODEL : 9314-3
TIMEBASE
DWG NO: 9314-3-S1
SH 2 OF 5
ECO : 1024
8-DEC-82



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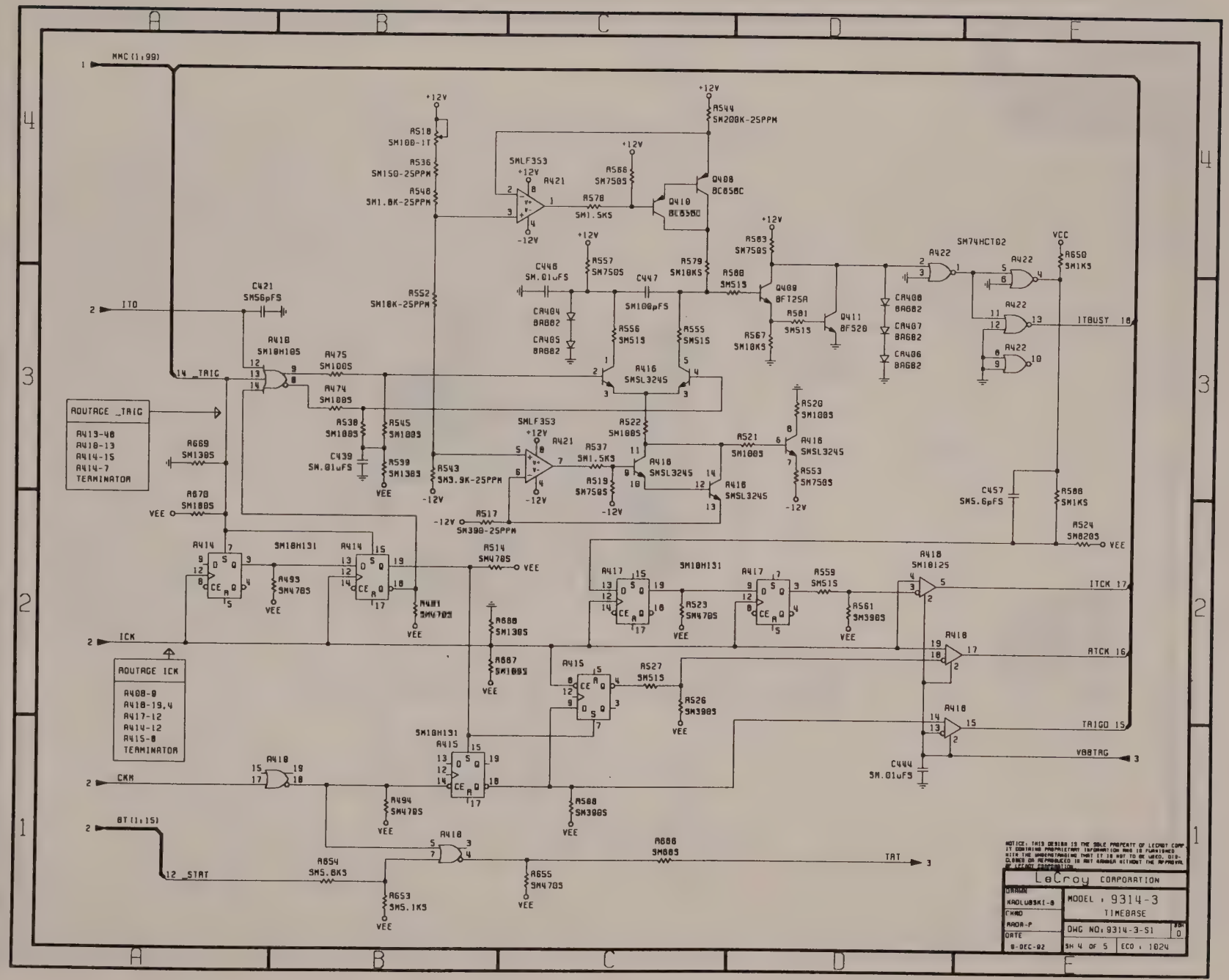
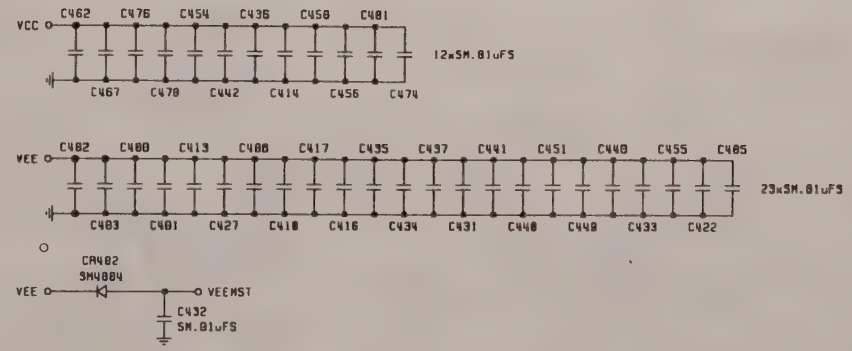
LeCroy CORPORATION

DRAWN	MODEL : 9314-3
KAOLUBSKI-B	TIMEBASE
CHKD	DWG NO: 9314-3-51 REV 0
AADA-P	SH 3 OF 5 ECO : 1024
DATE	
8-DEC-92	


MMC(1:99)
ITO
_TRIG
ROUTAGE _TRIG
A419-48
A418-13
A414-15
A414-7
TERMINATOR
ICK
ROUTAGE ICK
A408-8
A418-19,4
A417-12
A414-12
A415-8
TERMINATOR
CKM
BT(1:15)
12 _STAT
+12V
-12V
VEE
VCC
SM74HCT02
SM10H131
SMLF353
ITBUST 18
ITCK 17
ATCK 16
TAIGD 15
V88TAG 3
TAT 3
LeCroy CORPORATION
MODEL : 9314-3
TIMEBASE
DWG NO: 9314-3-S1
SH 4 OF 5
ECO : 1024
DRAWN KADLUBSKI-B
CHKD RAOR-P
DATE 8-DEC-92



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LeCroy CORPORATION

DRAWN KADLUBSKI-B	MODEL : 9314-3 TIMEBASE
CHKD MADA-P	DWG NO: 9314-3-S1 REV 0
DATE 8-DEC-92	SH 5 OF 5 ECO : 1024

VIEW A
VIEW B
TIME BASE
9310-3 Rev:G
A425
A413
A404
A407
A410
A414
A417
A424
A428
A427
A429
A430
A416
A422
A421
A418
A415
A408
A405
A406
A409
A411
A419
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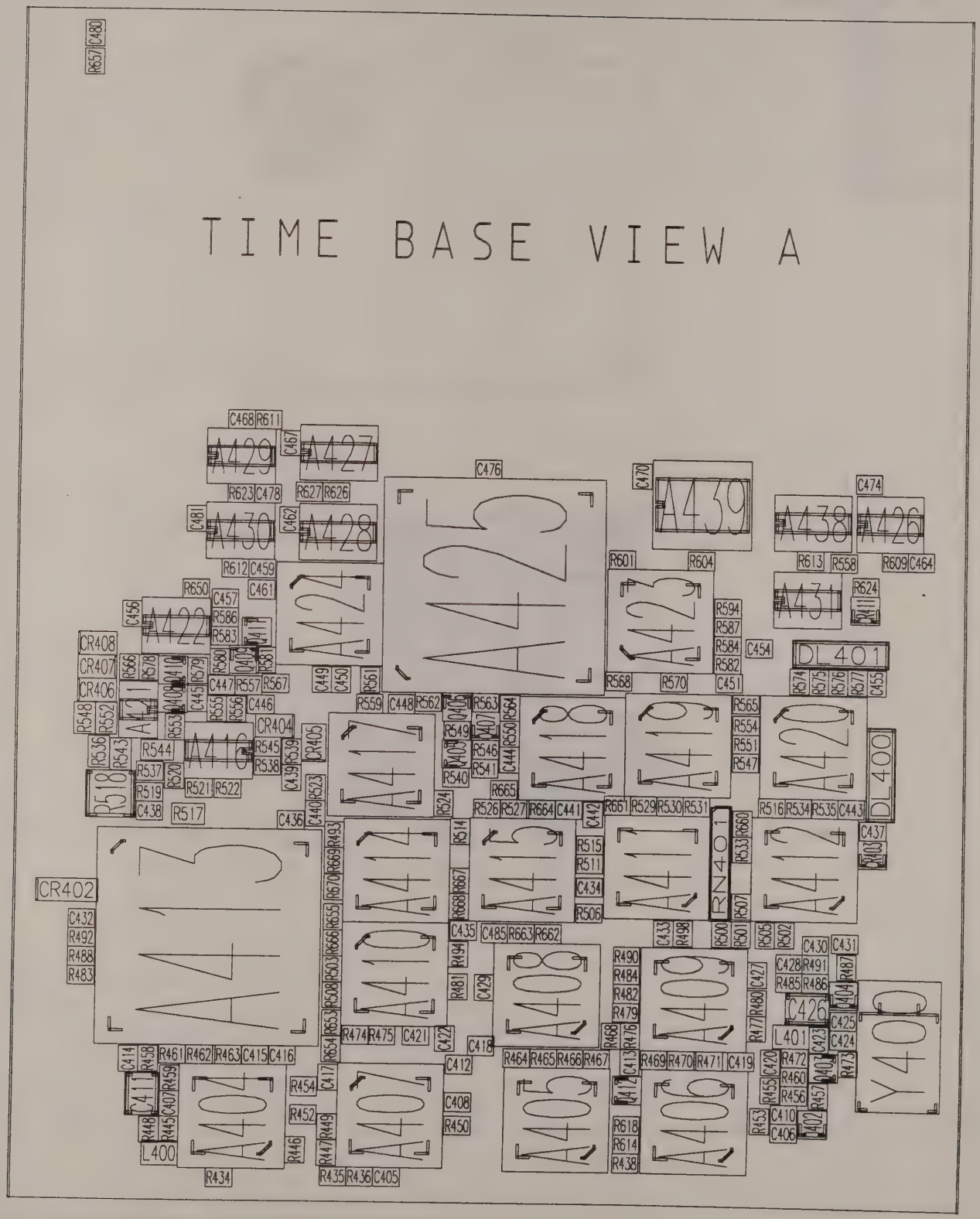
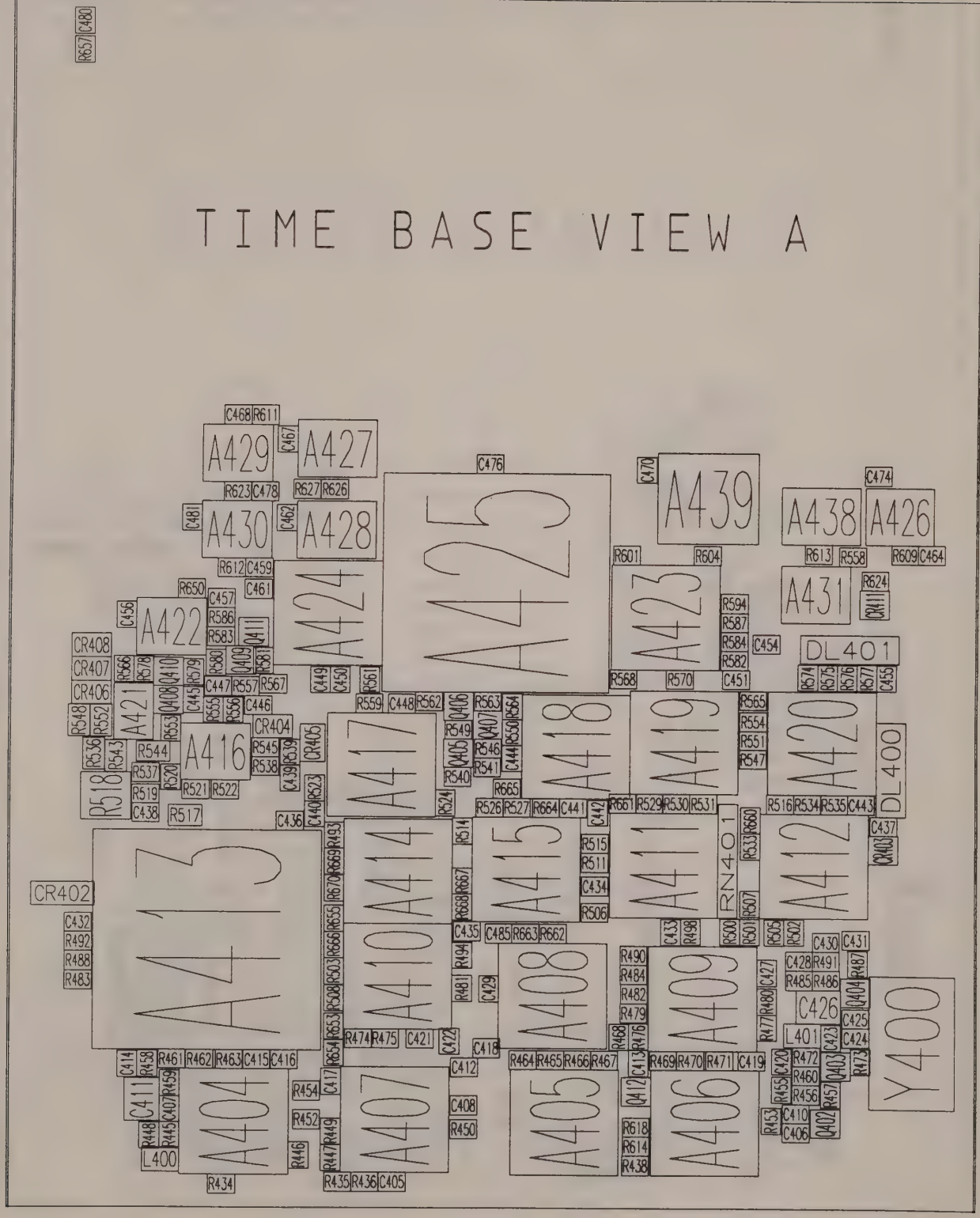
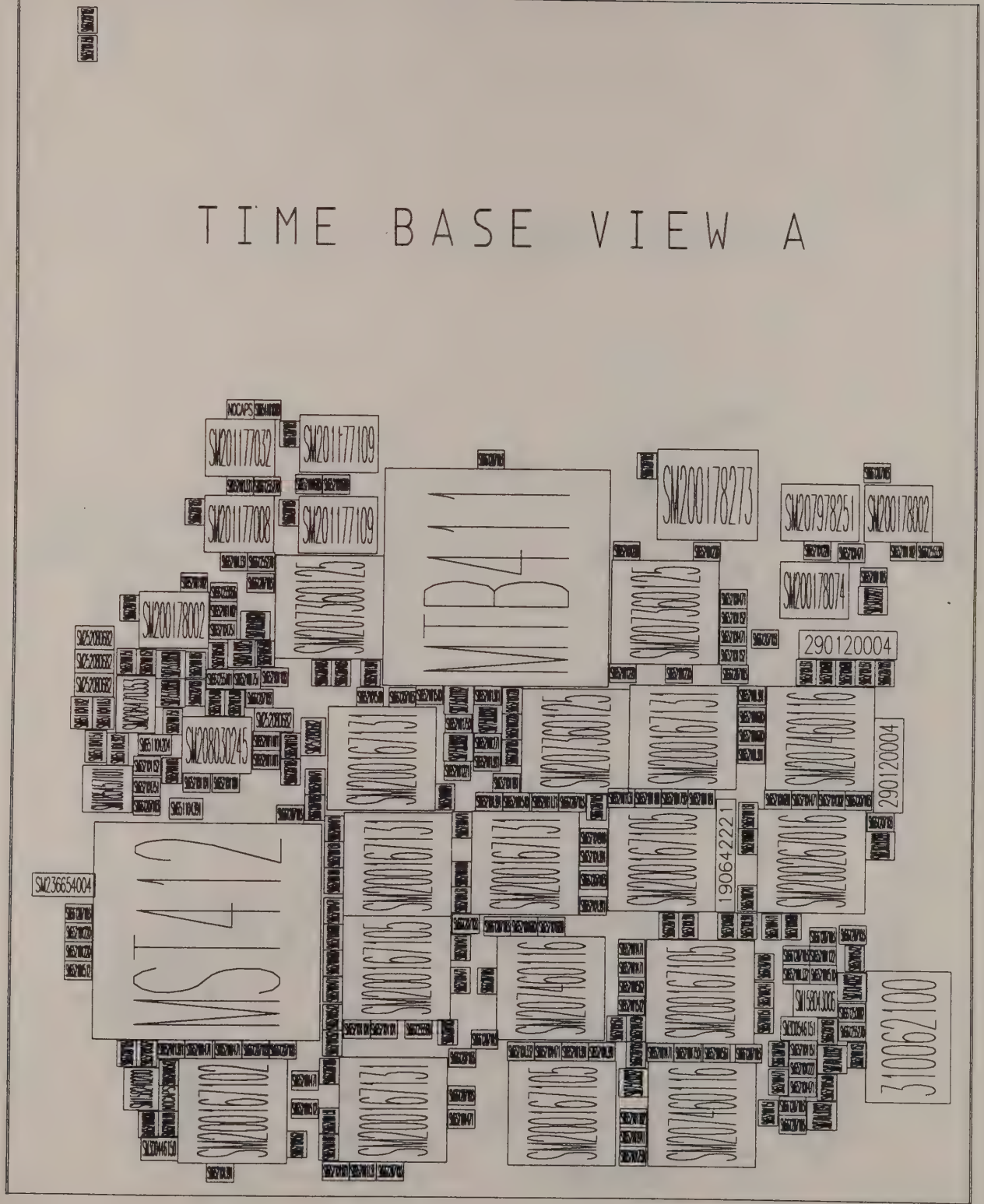
A401
A403
A402
A400


TIME BASE VIEW A

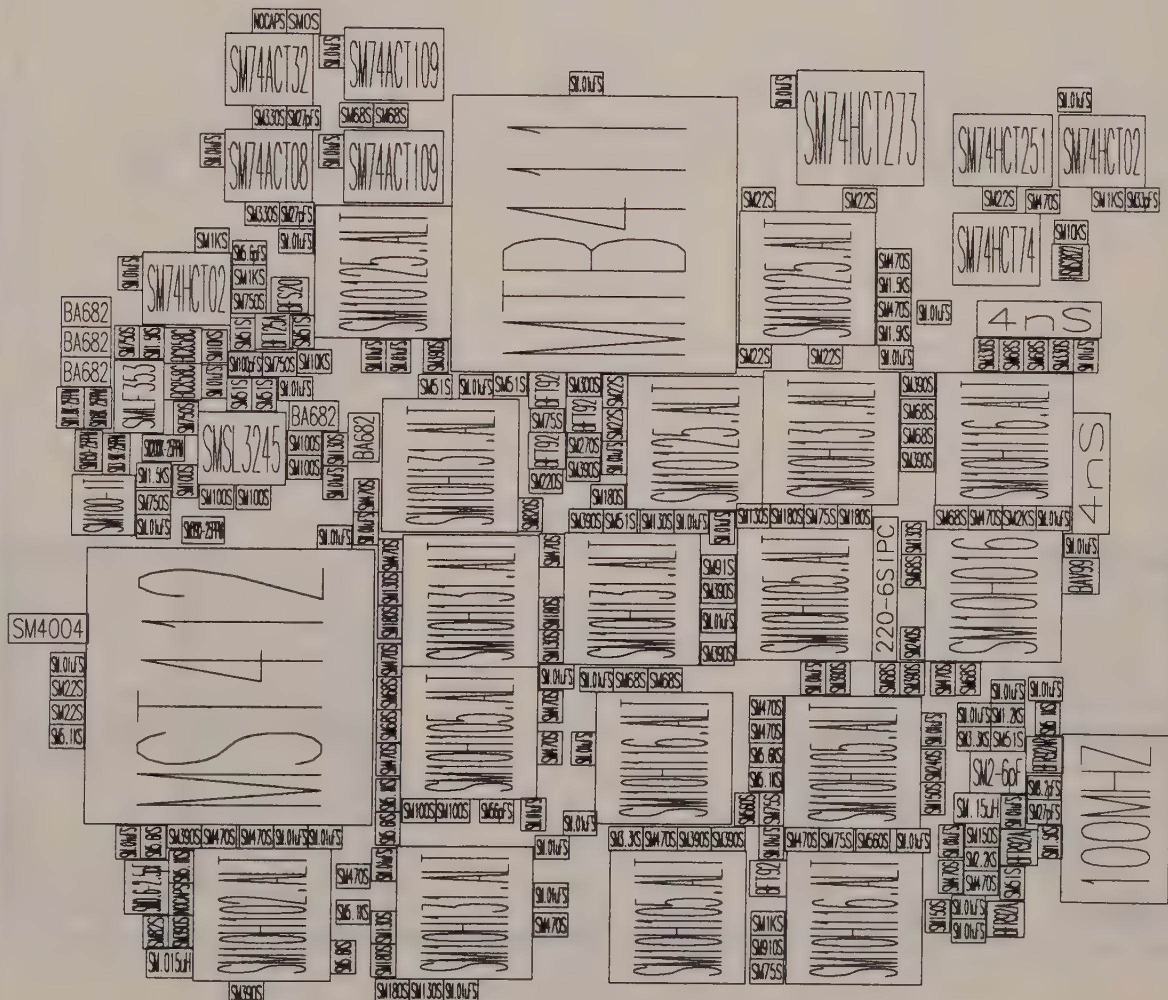
TIME BASE VIEW A

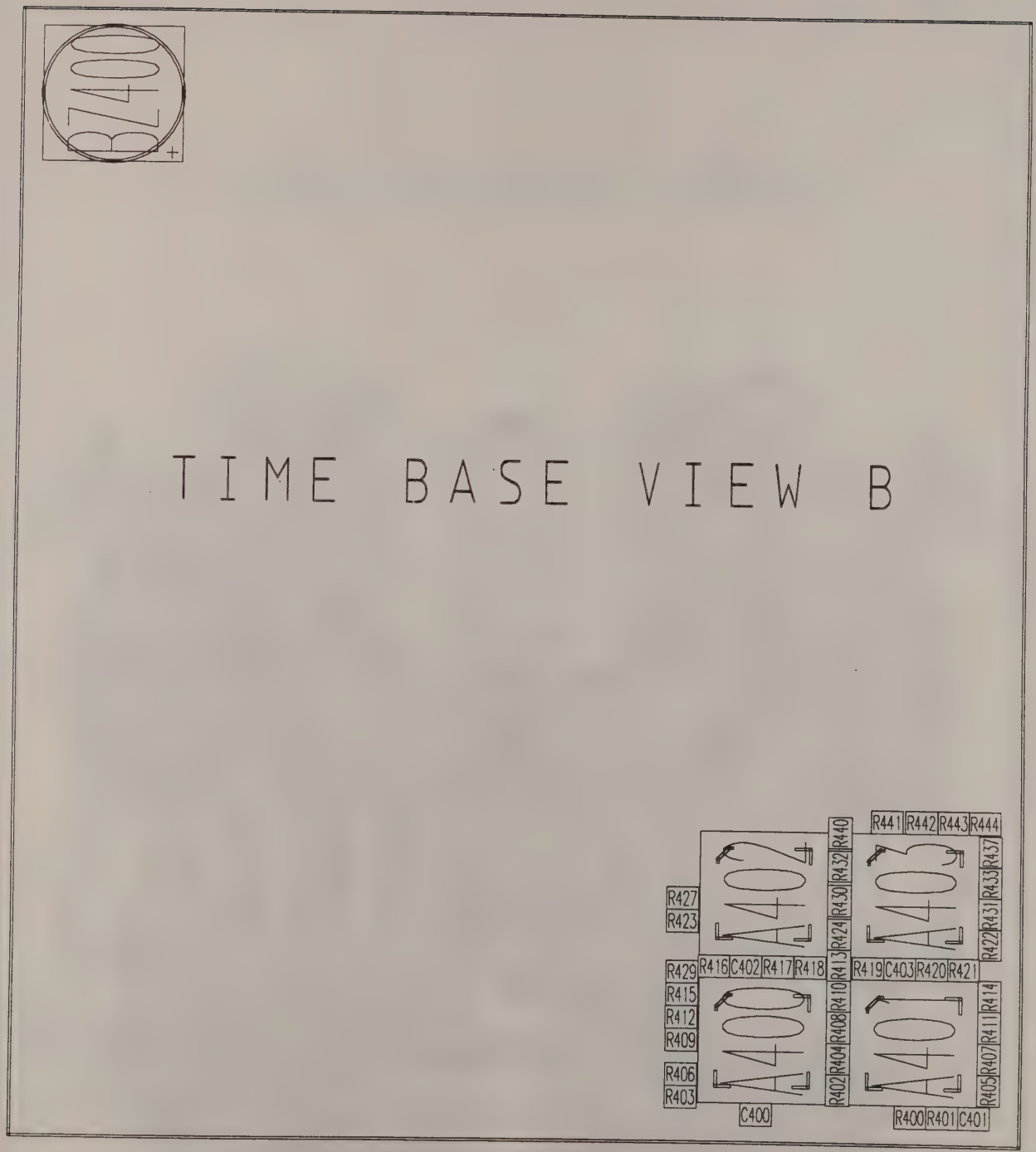


TIME BASE VIEW A



TIME BASE VIEW A

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R416
C402
R417
R418
R419
C403
R420
R421
R441
R442
R443
R444
R440
R432
R430
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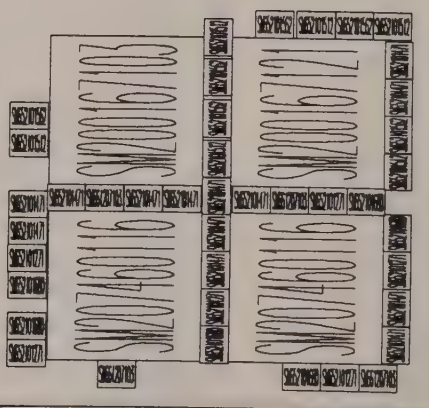
C401

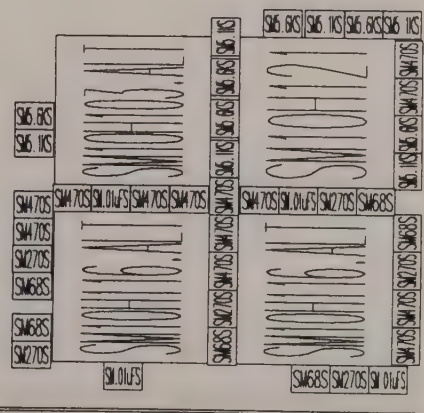
5370400006

TIME BASE VIEW B



HMB-06

TIME BASE VIEW B



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A7	SM207978251	SM74HCT251	SOIC_16
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A28	SM201177008	SM74ACT08	SOIC_14
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C3020	SM661207103	SM.01uFS	SM0805
C3021	SM661207103	SM.01uFS	SM0805
C3022	SM661207103	SM.01uFS	SM0805
C3023	SM661255056	SM5.6pFS	SM0805
C3024	SM661207103	SM.01uFS	SM0805
C3025	158849009	0.5-2.5pF-S	CAPS_S
C3026	SM661255220	SM22pFS	SM0805
C3027	SM661207103	SM.01uFS	SM0805
C3028	SM661207103	SM.01uFS	SM0805
C3029	SM661207103	SM.01uFS	SM0805
C3031	SM661207103	SM.01uFS	SM0805
C3032	SM661207103	SM.01uFS	SM0805
C3033	SM661207103	SM.01uFS	SM0805
C3034	SM661207103	SM.01uFS	SM0805
C3035	SM661255101	SM100pFS	SM0805
C3036	SM661207103	SM.01uFS	SM0805
C3037	SM661207103	SM.01uFS	SM0805
C3038	SM661207103	SM.01uFS	SM0805
C3039	SM661207103	SM.01uFS	SM0805
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C3042	SM661207103	SM.01uFS	SM0805
C3043	SM661207103	SM.01uFS	SM0805
C3044	SM661207103	SM.01uFS	SM0805
C3045	SM661207103	SM.01uFS	SM0805
C3046	SM661207103	SM.01uFS	SM0805
C3047	SM661207103	SM.01uFS	SM0805
C3048	SM666327225	SM2.2uF-20V	SMCAPETD2
C3049	SM666327225	SM2.2uF-20V	SMCAPETD2
C3050	SM666327225	SM2.2uF-20V	SMCAPETD2

C3051	SM666327225	SM2.2uF-20V	SMCAPETD2
C3052	SM666327225	SM2.2uF-20V	SMCAPETD2
C3053	SM661255181	SM180pFS	SM0805
C3054	SM661255270	SM27pFS	SM0805
C3055	SM661207103	SM.01uFS	SM0805
C3500	SM661207103	SM.01uFS	SM0805
C3501	SM661207103	SM.01uFS	SM0805
C3502	SM661207103	SM.01uFS	SM0805
C3503	SM661207103	SM.01uFS	SM0805
C3504	SM661207103	SM.01uFS	SM0805
C3505	SM661207103	SM.01uFS	SM0805
C3506	SM661207103	SM.01uFS	SM0805
C3507	SM661207103	SM.01uFS	SM0805
C3508	SM661207103	SM.01uFS	SM0805
C3509	SM661207103	SM.01uFS	SM0805
C3510	SM666237476	SM47uF-6V	SMCAPD
C3511	SM661207103	SM.01uFS	SM0805
C3512	SM661207103	SM.01uFS	SM0805
C3513	SM661207103	SM.01uFS	SM0805
C3514	SM661207103	SM.01uFS	SM0805
C3515	SM661207103	SM.01uFS	SM0805
C3516	SM661207103	SM.01uFS	SM0805
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C3518	SM661207103	SM.01uFS	SM0805
C3519	SM661207103	SM.01uFS	SM0805
C3520	SM661207103	SM.01uFS	SM0805
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C3522	SM661207103	SM.01uFS	SM0805
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C3524	SM661207103	SM.01uFS	SM0805
C3525	SM661207103	SM.01uFS	SM0805
C4000	SM661207103	SM.01uFS	SM0805
C4001	SM661207103	SM.01uFS	SM0805
C4002	SM661127104	SM.1uF	SM1206
C4003	158849012	5-15pF-S	CAPS_S
C4004	SM661255056	SM5.6pFS	SM0805
C4005	SM661207103	SM.01uFS	SM0805
C4006	SM661207103	SM.01uFS	SM0805
C4007	SM661127104	SM.1uF	SM1206
C4008	SM661255180	SM18pFS	SM0805
C4009	SM661255820	SM82pFS	SM0805
C4011	SM661207103	SM.01uFS	SM0805
C4012	SM661495561	SM560pFS-500V	SM0805
C4013	SM661127104	SM.1uF	SM1206
C4014	SM661207103	SM.01uFS	SM0805
C4015	SM661207103	SM.01uFS	SM0805
C4016	SM661207103	SM.01uFS	SM0805
C4017	SM661207223	SM.022uFS	SM0805
C4018	SM661207103	SM.01uFS	SM0805
C4019	SM661127104	SM.1uF	SM1206
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C4022	SM661207103	SM.01uFS	SM0805
C4023	SM661255056	SM5.6pFS	SM0805
C4024	SM661207103	SM.01uFS	SM0805
C4025	158849009	0.5-2.5pF-S	CAPS_S
C4026	SM661255220	SM22pFS	SM0805
C4027	SM661207103	SM.01uFS	SM0805
C4028	SM661207103	SM.01uFS	SM0805
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C4031	SM661207103	SM.01uFS	SM0805
C4032	SM661207103	SM.01uFS	SM0805
C4033	SM661207103	SM.01uFS	SM0805
C4034	SM661207103	SM.01uFS	SM0805

C4035	SM661255101	SM100pFS	SM0805
C4036	SM661207103	SM.01uFS	SM0805
C4037	SM661207103	SM.01uFS	SM0805
C4038	SM661207103	SM.01uFS	SM0805
C4039	SM661207103	SM.01uFS	SM0805
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C4045	SM661207103	SM.01uFS	SM0805
C4046	SM661207103	SM.01uFS	SM0805
C4047	SM661207103	SM.01uFS	SM0805
C4048	SM666327225	SM2.2uF-20V	SMCAPETD2
C4049	SM666327225	SM2.2uF-20V	SMCAPETD2
C4050	SM666327225	SM2.2uF-20V	SMCAPETD2
C4051	SM666327225	SM2.2uF-20V	SMCAPETD2
C4052	SM666327225	SM2.2uF-20V	SMCAPETD2
C4053	SM661255181	SM180pFS	SM0805
C4054	SM661255270	SM27pFS	SM0805
C4055	SM661207103	SM.01uFS	SM0805
C4500	SM661207103	SM.01uFS	SM0805
C4501	SM661207103	SM.01uFS	SM0805
C4502	SM661207103	SM.01uFS	SM0805
C4503	SM661207103	SM.01uFS	SM0805
C4504	SM661207103	SM.01uFS	SM0805
C4505	SM661207103	SM.01uFS	SM0805
C4506	SM661207103	SM.01uFS	SM0805
C4507	SM661207103	SM.01uFS	SM0805
C4508	SM661207103	SM.01uFS	SM0805
C4509	SM661207103	SM.01uFS	SM0805
C4510	SM666237476	SM47uF-6V	SMCAPD
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C4525	SM661207103	SM.01uFS	SM0805
C5000	SM661207103	SM.01uFS	SM0805
C5001	SM661250047	SM4.7pFS	SM0805
C5002	SM661207103	SM.01uFS	SM0805
C5003	SM661255027	SM2.7pFS	SM0805
C5004	SM661207103	SM.01uFS	SM0805
C5005	SM661495561	SM560pFS-500V	SM0805
C5006	SM661255033	SM3.3pFS	SM0805
C5007	SM661207103	SM.01uFS	SM0805
C5008	SM661255220	SM22pFS	SM0805
C5010	SM661207103	SM.01uFS	SM0805
C5011	SM661250047	SM4.7pFS	SM0805
C5012	SM661207103	SM.01uFS	SM0805
C5013	SM661255470	SM47pFS	SM0805
C5014	SM661255220	SM22pFS	SM0805
C5015	SM661207103	SM.01uFS	SM0805
C5016	SM661207103	SM.01uFS	SM0805
C5017	SM661207103	SM.01uFS	SM0805

C5018	SM661207103	SM.01uFS	SM0805
C5019	SM661207103	SM.01uFS	SM0805
C5020	SM661207103	SM.01uFS	SM0805
C5021	SM661250082	SM8.2pFS	SM0805
C5022	SM661250082	SM8.2pFS	SM0805
C5023	SM666427105	SM1uF-16V	SMCAPTE_Y
C5024	SM661207103	SM.01uFS	SM0805
C5025	SM661205822	SM.0082uFS	SM0805
C5026	SM661207103	SM.01uFS	SM0805
C5027	SM666427105	SM1uF-16V	SMCAPTE_Y
C5028	SM661207103	SM.01uFS	SM0805
C5029	SM661205822	SM.0082uFS	SM0805
C5030	SM661207103	SM.01uFS	SM0805
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C5038	SM661207103	SM.01uFS	SM0805
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C5041	SM661207103	SM.01uFS	SM0805
C5042	SM661207103	SM.01uFS	SM0805
C5043	SM661207103	SM.01uFS	SM0805
C5044	SM661127104	SM.1uF	SM1206
C5045	SM661255821	SM820pFS	SM0805
C5046	SM661127104	SM.1uF	SM1206
C5047	SM666327225	SM2.2uF-20V	SMCAPETD2
C5048	SM666327225	SM2.2uF-20V	SMCAPETD2
C5049	SM661207103	SM.01uFS	SM0805
C5050	SM661207103	SM.01uFS	SM0805
C5051	SM666327225	SM2.2uF-20V	SMCAPETD2
C5052	SM666327225	SM2.2uF-20V	SMCAPETD2
C5056	SM661255100	SM10pFS	SM0805
C6000	SM661207103	SM.01uFS	SM0805
C6001	SM661207103	SM.01uFS	SM0805
C6002	SM666327225	SM2.2uF-20V	SMCAPETD2
C6003	SM666327225	SM2.2uF-20V	SMCAPETD2
CR1	SM236030099	BAV99	SOT23
CR402	SM236654004	SM4004	SMDIO_MLL41
CR403	SM236030099	BAV99	SOT23
CR404	SM252080682	BA682	SOD80
CR405	SM252080682	BA682	SOD80
CR406	SM252080682	BA682	SOD80
CR407	SM252080682	BA682	SOD80
CR408	SM252080682	BA682	SOD80
CR411	SM232022822	HSMS2822	SOT23
CR3000	SM236030099	BAV99	SOT23
CR3001	NOBAV99	NOBAV99	SOT23
CR3002	SM236030099	BAV99	SOT23
CR3003	SM252023018	BAT18	SOT23
CR3004	SM240050051	TZMC5V1	SMDIO_MINIMELF
CR4000	SM236030099	BAV99	SOT23
CR4001	NOBAV99	NOBAV99	SOT23
CR4002	SM236030099	BAV99	SOT23
CR4003	SM252023018	BAT18	SOT23
CR4004	SM240050051	TZMC5V1	SMDIO_MINIMELF
CR5000	NOBAV99	NOBAV99	SOT23
CR5001	SM252023018	BAT18	SOT23
CR5002	SM232120070	BAV70	SOT23
CR5003	SM232120070	BAV70	SOT23
CR5004	SM240050033	TZMC3V3	SMDIO_MINIMELF

CR5005	SM240050033	TZMC3V3	SMDIO_MINIMELF
CR6000	SM253032823	HSMS2823	SOT23
CR6001	SM232022822	HSMS2822	SOT23
CR6003	SM240050051	TZMC5V1	SMDIO_MINIMELF
DL400	290120004	4nS	BEL_DELAY
DL401	290120004	4nS	BEL_DELAY
J1	454320096	3x32-ST-F	CONN3X32_ST_F
J2	454110010	POWER1x10-M	POWER1X10_M
J3	454390002	1x2-ST-M-PL	CONN1X2_ST_M_PL
J100	NOCONN	NO2x2-RA-M	CONN2X2_RA_M_NW_BH
J3000	BNC-ITI-WR	BNC-ITI-WR	BNC_ITI_WR
J4000	BNC-ITI-WR	BNC-ITI-WR	BNC_ITI_WR
J5000	BNC-ITI-WR	BNC-ITI-WR	BNC_ITI_WR
J6000	402110302	BNC-9450	BNC_9450
L101	SM301502001	SMBEAD1206	SMBEAD1206
L104	SM301502001	SMBEAD1206	SMBEAD1206
L105	SM301502001	SMBEAD1206	SMBEAD1206
L106	SM301502001	SMBEAD1206	SMBEAD1206
L107	SM301502001	SMBEAD1206	SMBEAD1206
L200	SM301502001	SMBEAD1206	SMBEAD1206
L201	SM301502001	SMBEAD1206	SMBEAD1206
L202	SM301502001	SMBEAD1206	SMBEAD1206
L203	SM301502001	SMBEAD1206	SMBEAD1206
L400	SM300446150	SM.015uH	SMSELF
L401	SM300546151	SM.15uH	SMSELF
L3000	SM300486104	SM100uH	SM1210
L3002	SM301502001	SMBEAD1206	SMBEAD1206
L3003	SM301502001	SMBEAD1206	SMBEAD1206
L3004	SM301502001	SMBEAD1206	SMBEAD1206
L3005	SM301502001	SMBEAD1206	SMBEAD1206
L3006	SM301502001	SMBEAD1206	SMBEAD1206
L3500	SM301502001	SMBEAD1206	SMBEAD1206
L4000	SM300486104	SM100uH	SM1210
L4002	SM301502001	SMBEAD1206	SMBEAD1206
L4003	SM301502001	SMBEAD1206	SMBEAD1206
L4004	SM301502001	SMBEAD1206	SMBEAD1206
L4005	SM301502001	SMBEAD1206	SMBEAD1206
L4006	SM301502001	SMBEAD1206	SMBEAD1206
L4500	SM301502001	SMBEAD1206	SMBEAD1206
L5000	SM301502001	SMBEAD1206	SMBEAD1206
L5001	SM301502001	SMBEAD1206	SMBEAD1206
L5002	SM301502001	SMBEAD1206	SMBEAD1206
L5003	SM301502001	SMBEAD1206	SMBEAD1206
L6000	SM301502001	SMBEAD1206	SMBEAD1206
L6001	SM301502001	SMBEAD1206	SMBEAD1206
Q402	SM270130092	BFR92A	SOT23
Q403	SM270130092	BFR92A	SOT23
Q404	SM270140092	BFR92AR	SOT23
Q405	SM275030092	BFT92	SOT23
Q406	SM275030092	BFT92	SOT23
Q407	SM275030092	BFT92	SOT23
Q408	SM275330858	BC858C	SOT23
Q409	SM207130025	BFT25A	SOT23
Q410	SM275330858	BC858C	SOT23
Q411	SM270030020	BFS20	SOT23
Q412	SM275030092	BFT92	SOT23
Q3000	SM280124416	SST4416	SOT23
Q3001	SM270130092	BFR92A	SOT23
Q3002	SM270130092	BFR92A	SOT23
Q3003	SM289240062	BCV62	SOT143
Q3004	SM275040093	BFT93R	SOT23
Q3005	SM275030093	BFT93	SOT23
Q3006	SM270130092	BFR92A	SOT23
Q3007	SM275330858	BC858C	SOT23

Q3008	SM275030092	BFT92	SOT23
Q3009	SM275030092	BFT92	SOT23
Q3010	SM275030092	BFT92	SOT23
Q3011	SM270130092	BFR92A	SOT23
Q3012	SM270130092	BFR92A	SOT23
Q3500	SM275330858	BC858C	SOT23
Q3501	SM270330848	BC848C	SOT23
Q4000	SM280124416	SST4416	SOT23
Q4001	SM270130092	BFR92A	SOT23
Q4002	SM270130092	BFR92A	SOT23
Q4003	SM289240062	BCV62	SOT143
Q4004	SM275040093	BFT93R	SOT23
Q4005	SM275030093	BFT93	SOT23
Q4006	SM270130092	BFR92A	SOT23
Q4007	SM275330858	BC858C	SOT23
Q4008	SM275030092	BFT92	SOT23
Q4009	SM275030092	BFT92	SOT23
Q4010	SM275030092	BFT92	SOT23
Q4011	SM270130092	BFR92A	SOT23
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Q4500	SM275330858	BC858C	SOT23
Q4501	SM270330848	BC848C	SOT23
Q5000	SM270130092	BFR92A	SOT23
Q5001	SM280124416	SST4416	SOT23
Q5003	SM270130093	BFR93A	SOT23
Q5004	SM270130092	BFR92A	SOT23
Q6000	SM270130092	BFR92A	SOT23
Q6001	SM270130092	BFR92A	SOT23
Q6002	SM275030550	BF550	SOT23
Q6003	SM270130092	BFR92A	SOT23
Q6005	SM275030550	BF550	SOT23
R1	SM652101223	SM22KS	SM0805
R2	169416473	NTC-DISC-47K	NTC_DISC
R3	SM652101220	SM22S	SM0805
R4	SM652101103	SM10KS	SM0805
R5	SM652101512	SM5.1KS	SM0805
R6	SM652101103	SM10KS	SM0805
R7	SM652101512	SM5.1KS	SM0805
R8	SM652101103	SM10KS	SM0805
R9	SM652101102	SM1KS	SM0805
R10	SM652101103	SM10KS	SM0805
R11	SM652101103	SM10KS	SM0805
R12	SM652101103	SM10KS	SM0805
R13	SM652101475	SM4.7MS	SM0805
R14	SM652101103	SM10KS	SM0805
R15	161445100	10-1/2W	RES20
R16	181447104	100K-12T	POT66WR
R17	181447104	100K-12T	POT66WR
R18	SM652101623	SM62KS	SM0805
R19	SM652101103	SM10KS	SM0805
R20	SM652101103	SM10KS	SM0805
R21	SM652101103	SM10KS	SM0805
R22	SM652101103	SM10KS	SM0805
R25	SM652101220	SM22S	SM0805
R26	SM652101220	SM22S	SM0805
R27	SM652101220	SM22S	SM0805
R32	SM652101750	SM75S	SM0805
R33	SM652101680	SM68S	SM0805
R34	SM652101680	SM68S	SM0805
R35	SM652101680	SM68S	SM0805
R36	SM652101220	SM22S	SM0805
R37	SM652101220	SM22S	SM0805
R38	SM652101220	SM22S	SM0805
R40	SM652101112	SM1.1KS	SM0805

R41	SM652101271	SM270S	SM0805
R100	SM652101103	SM10KS	SM0805
R101	SM652101103	SM10KS	SM0805
R102	SM652101103	SM10KS	SM0805
R103	SM652101103	SM10KS	SM0805
R104	SM652101103	SM10KS	SM0805
R105	SM652101103	SM10KS	SM0805
R106	SM652101103	SM10KS	SM0805
R107	SM652101103	SM10KS	SM0805
R108	SM652101103	SM10KS	SM0805
R109	SM652101103	SM10KS	SM0805
R110	SM652101103	SM10KS	SM0805
R111	SM652101103	SM10KS	SM0805
R112	SM652101301	SM300S	SM0805
R113	SM652101510	SM51S	SM0805
R114	SM652101151	SM150S	SM0805
R115	SM652101103	SM10KS	SM0805
R116	SM168659007	SM3.0K-1/oo	SMRES_MINIMELF
R117	SM168659004	SM900-1/oo	SMRES_MINIMELF
R118	SM168659297	SM100-1/oo	SMRES_MINIMELF
R119	SM652101301	SM300S	SM0805
R120	SM652101103	SM10KS	SM0805
R121	SM652101151	SM150S	SM0805
R125	SM652101101	SM100S	SM0805
R200	SM652101391	SM390S	SM0805
R400	SM652101680	SM68S	SM0805
R401	SM652101271	SM270S	SM0805
R402	SM652101680	SM68S	SM0805
R403	SM652101271	SM270S	SM0805
R404	SM652101271	SM270S	SM0805
R405	SM652101471	SM470S	SM0805
R406	SM652101680	SM68S	SM0805
R407	SM652101471	SM470S	SM0805
R408	SM652101471	SM470S	SM0805
R409	SM652101680	SM68S	SM0805
R410	SM652101471	SM470S	SM0805
R411	SM652101271	SM270S	SM0805
R412	SM652101271	SM270S	SM0805
R413	SM652101471	SM470S	SM0805
R414	SM652101680	SM68S	SM0805
R415	SM652101471	SM470S	SM0805
R416	SM652101471	SM470S	SM0805
R417	SM652101471	SM470S	SM0805
R418	SM652101471	SM470S	SM0805
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R5011	SM652101391	SM390S	SM0805
R5012	SM652101272	SM2.7KS	SM0805
R5013	SM652101151	SM150S	SM0805
R5014	SM652101475	SM4.7MS	SM0805
R5015	SM652110904	SM900K-5/oo	SM1206
R5016	SM652101510	SM51S	SM0805
R5017	SM652101104	SM100KS	SM0805
R5018	SM652101390	SM39S	SM0805
R5019	SM168659006	SM111.1K-1/oo	SMRES_MINIMELF
R5020	SM652101100	SM10S	SM0805
R5022	SM652101103	SM10KS	SM0805
R5023	SM652110904	SM900K-5/oo	SM1206
R5024	SM652101510	SM51S	SM0805
R5026	SM652101510	SM51S	SM0805
R5028	SM652101331	SM330S	SM0805
R5029	SM652101391	SM390S	SM0805
R5030	SM652101101	SM100S	SM0805
R5031	SM652101431	SM430S	SM0805
R5032	SM652101431	SM430S	SM0805
R5033	SM652101101	SM100S	SM0805
R5034	SM652101471	SM470S	SM0805
R5035	SM652101222	SM2.2KS	SM0805
R5037	SM652101222	SM2.2KS	SM0805
R5040	SM652101391	SM390S	SM0805
R5041	SM652101391	SM390S	SM0805
R5042	SM652101332	SM3.3KS	SM0805
R5043	SM652101391	SM390S	SM0805
R5044	SM652101332	SM3.3KS	SM0805
R5045	SM652101163	SM16KS	SM0805
R5046	SM652101332	SM3.3KS	SM0805
R5047	SM652101391	SM390S	SM0805
R5048	SM652101332	SM3.3KS	SM0805
R5049	SM652101163	SM16KS	SM0805
R5050	SM652101750	SM75S	SM0805
R5051	SM185457203	SM20K-1T	SMPOT_ST4
R5052	SM652101561	SM560S	SM0805
R5053	SM652101750	SM75S	SM0805
R5054	SM185457203	SM20K-1T	SMPOT_ST4
R5055	SM652101561	SM560S	SM0805
R5056	SM652101512	SM5.1KS	SM0805
R5057	SM652101512	SM5.1KS	SM0805
R5058	SM652101474	SM470KS	SM0805
R5059	SM652101824	SM820KS	SM0805
R5060	SM652101684	SM680KS	SM0805
R5061	SM652101222	SM2.2KS	SM0805
R5062	SM652101153	SM15KS	SM0805
R5063	SM652101153	SM15KS	SM0805
R5064	SM652101222	SM2.2KS	SM0805

R5065	SM652101222	SM2.2KS	SM0805
R5072	SM652101750	SM75S	SM0805
R5073	SM652101750	SM75S	SM0805
R5075	SM652101511	SM510S	SM0805
R5076	SM652101511	SM510S	SM0805
R5077	SM652101181	SM180S	SM0805
R6000	SM652101112	SM1.1KS	SM0805
R6001	SM652101112	SM1.1KS	SM0805
R6002	SM652101391	SM390S	SM0805
R6003	SM652101112	SM1.1KS	SM0805
R6004	SM652101331	SM330S	SM0805
R6005	SM168659297	SM100-1/oo	SMRES_MINIMELF
R6006	SM168659297	SM100-1/oo	SMRES_MINIMELF
R6008	SM168659297	SM100-1/oo	SMRES_MINIMELF
R6009	SM168659004	SM900-1/oo	SMRES_MINIMELF
R6012	SM168659007	SM3.0K-1/oo	SMRES_MINIMELF
R6013	SM652101512	SM5.1KS	SM0805
R6014	SM168659007	SM3.0K-1/oo	SMRES_MINIMELF
R6015	SM168659007	SM3.0K-1/oo	SMRES_MINIMELF
R6016	SM168659007	SM3.0K-1/oo	SMRES_MINIMELF
R6017	SM652101131	SM130S	SM0805
R6018	SM652101181	SM180S	SM0805
R6019	SM652101512	SM5.1KS	SM0805
R6020	SM652101511	SM510S	SM0805
RL3000	430441732	RL-732-12	RELAYS732_12
RL3001	430430002	RL-FBR22-12	RL_FBR20
RL3002	430441732	RL-732-12-P4UNP	RELAYS732_12_P4UNP
RL3003	430430002	RL-FBR22-12	RL_FBR20
RL4000	430441732	RL-732-12	RELAYS732_12
RL4001	430430002	RL-FBR22-12	RL_FBR20
RL4002	430441732	RL-732-12-P4UNP	RELAYS732_12_P4UNP
RL4003	430430002	RL-FBR22-12	RL_FBR20
RL5000	430490003	RL-TQ2-12	DIP10
RL5001	430490003	RL-TQ2-12	DIP10
RL5002	430490003	RL-TQ2-12	DIP10
RN1	190642103	10K-6SIPC	SIP6RES
RN2	190642472	4.7K-6SIPC	SIP6RES
RN3	190042103	10K-SIPC	SIP10RES
RN4	190042103	10K-SIPC	SIP10RES
RN5	190042103	10K-SIPC	SIP10RES
RN6	190042103	10K-SIPC	SIP10RES
RN7	190042103	10K-SIPC	SIP10RES
RN400	190642221	220-6SIPC	SIP6RES
RN401	190642221	220-6SIPC	SIP6RES
RN3500	190042471	470-SC	SIP10RES
RN4500	190042471	470-SC	SIP10RES
S200	SM654101000	SM0S-2P	SM0805_2P
S201	SM654101000	SM0S-2P	SM0805_2P
TP100	454313010	2x5-ST-M-NW-SP	CONN2X5_ST_M_NW
TP101	454313010	2x5-ST-M-NW-SP	CONN2X5_ST_M_NW
TP200	454313010	2x5-ST-M-NW-SP	CONN2X5_ST_M_NW
TP3000	NOCONN	NO2x2-RA-M	CONN2X2_RA_M_NW_BH
TP3001	454340002	2x1-ST-M-NW	CONN2X1_ST_M_NW
TP3500	454315008	2x4-ST-M-NW-SP	CONN2X4_ST_M_NW
TP4000	NOCONN	NO2x2-RA-M	CONN2X2_RA_M_NW_BH
TP4001	454340002	2x1-ST-M-NW	CONN2X1_ST_M_NW
TP4500	454315008	2x4-ST-M-NW-SP	CONN2X4_ST_M_NW
TP5000	NOCONN	NO2x2-RA-M	CONN2X2_RA_M_NW_BH
TP5001	454340002	2x1-ST-M-NW	CONN2X1_ST_M_NW
Y400	310062100	100MHZ	CRYSTAL_NC18

MFG,RE,290,2 LeCroy Division ITI Production Database PLANT CODE: ITI_(
29-MAR-1993 11:22

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: F9310-3
DESC: MAIN CARD DUAL 100Ms/s , 10K UOM: EA SC: R REV: O

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE
205750000	IC AND-OR GATE ARRAY 16V8		3	P	EA	4.00	1.000	31/10/91	99/99/99
S9310-31	COMMON PARTS FOR 9310-3	O	500	R	EA	1.00	1.000	17/07/92	99/99/99
SM205210128	IC 2K X8 RAM CY7C128-55SC		1	P	EA	16.00	1.000	00/00/00	99/99/99
SM661255220	CAP CERA CHIP 5% 22 PF		50	P	EA	4.00	1.000	28/08/92	99/99/99

MFG,RE,290,2 LeCroy Division ITI Production Database PLANT CODE: ITI_
29-MAR-1993 11:22

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: F9310M-3
DESC: MAIN CARD DUAL 100Ms/s , 50K UOM: EA SC: R REV: O

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE
205750000	IC AND-OR GATE ARRAY 16V8		1	P	EA	5.00	1.000	31/10/91	99/99/99
S9310-31	COMMON PARTS FOR 9310-3	O	500	R	EA	1.00	1.000	17/07/92	99/99/99
SM200248191	IC 4-BIT U/D CNTR 74HCT191		2	P	EA	4.00	1.000	00/00/00	99/99/99
SM205219264	IC 8K X 8 SRAM 70 NSEC 6264		3	P	EA	16.00	1.000	00/00/00	99/99/99
SM205290128	IC 128K X 8 PSRAM HM658128A		4	P	EA	2.00	1.000	00/00/00	99/99/99
SM661255220	CAP CERA CHIP 5% 22 PF		50	P	EA	6.00	1.000	28/08/92	99/99/99

MFG,RE,290,2 LeCroy Division ITI Production Database PLANT CODE: ITI_
29-MAR-1993 11:23

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: F9310L-3
DESC: MAIN CARD DUAL 100Ms/s , 1M UOM: EA SC: R REV: O

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE
205750000	IC AND-OR GATE ARRAY 16V8		1	P	EA	5.00	1.000	31/10/91	99/99/99
S9310-31	COMMON PARTS FOR 9310-3	O	500	R	EA	1.00	1.000	17/07/92	99/99/99
SM200248191	IC 4-BIT U/D CNTR 74HCT191		2	P	EA	4.00	1.000	00/00/00	99/99/99
SM205290128	IC 128K X 8 PSRAM HM658128A		3	P	EA	2.00	1.000	00/00/00	99/99/99
SM205701070	IC 128KX8 STAT RAM 70 NS		4	P	EA	16.00	1.000	00/00/00	99/99/99
SM661255220	CAP CERA CHIP 5% 22 PF		50	P	EA	6.00	1.000	28/08/92	99/99/99

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: S9310-3
DESC: COMMON PARTS FOR 9310-3 UOM: EA SC: R REV: F

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
146544471	CAP MINI ALUM 20% 470UF		1	P	EA	1.00	1.000	00/00/00	99/99/99	
158849013	CAP VARIABLE 6-25 PF		2	P	EA	2.00	1.000	00/00/00	99/99/99	
158899002	CAP VARIABLE .2 - .6 PF		3	P	EA	2.00	1.000	00/00/00	99/99/99	
161225101	RES COMP 1/8W 5% 100 OHMS		242	P	EA	2.00	1.000	31/10/91	99/99/99	
161225680	RES COMP 1/8W 5% 68 OHMS		258	P	EA	3.00	1.000	24/02/92	99/99/99	
161445100	RES COMP 1/2W 5% 10 OHMS		4	P	EA	1.00	1.000	00/00/00	99/99/99	
169416473	RESISTOR DISC NTC 47 K		5	P	EA	1.00	1.000	00/00/00	99/99/99	
181447104	RES VARI CERMET 100 K		6	P	EA	2.00	1.000	00/00/00	99/99/99	
190042103	RESISTOR NETWORK 10 K		7	P	EA	5.00	1.000	00/00/00	99/99/99	
190042471	RESISTOR NETWORK 470 OHMS		8	P	EA	2.00	1.000	00/00/00	99/99/99	
190642103	RESISTOR NETWORK 10 K		9	P	EA	1.00	1.000	00/00/00	99/99/99	
190642221	RESISTOR NETWORK 220 OHMS		10	P	EA	1.00	1.000	00/00/00	99/99/99	
190642472	RESISTOR NETWORK 4.7 K		11	P	EA	1.00	1.000	00/00/00	99/99/99	
207200200	IC 8-BIT FLASH ADC 77200		13	P	EA	2.00	1.000	00/00/00	99/99/99	
207280703	IC 16-BIT DAC 703		14	P	EA	1.00	1.000	00/00/00	99/99/99	
208122002	IC VOLT REG POS UA7805		15	P	EA	2.00	1.000	00/00/00	99/99/99	
208123002	IC +12 VOLT REG LM340T-12		18	P	EA	2.00	1.000	00/00/00	99/99/99	
208124002	IC VOLT REG -5V UA7905UC		16	P	EA	1.00	1.000	00/00/00	99/99/99	
208124003	IC VOLT REG NEG LM320T-12		17	P	EA	2.00	1.000	00/00/00	99/99/99	
290120004	DELAY LINE 4 NS		20	P	EA	2.00	1.000	19/12/91	99/99/99	
310062100	CRYSTAL 10PPM 100MHZ		21	P	EA	1.00	1.000	00/00/00	99/99/99	
380350950	SCOTCH TAPE DOUBLE SIDED 19MM		240	P	ME	0.06	1.000	27/03/92	99/99/99	
402110303	CONN PC MTG/THREAD BNC		22	P	EA	4.00	1.000	00/00/00	01/01/97	
403119004	HEADER RT ANGLE 4-PIN		243	P	EA	1.00	1.000	31/10/91	99/99/99	
430430002	RELAY 1 FORM C SPDT		24	P	EA	4.00	1.000	00/00/00	99/99/99	
430441732	RELAY 2 FORM CDPDT		25	P	EA	4.00	1.000	14/02/92	99/99/99	
430490003	RELAY 2 FORM C DPDT		26	P	EA	3.00	1.000	00/00/00	99/99/99	
454110010	HDR SOLD TAIL/MALE PIN 10		27	P	EA	1.00	1.000	00/00/00	99/99/99	
454313010	HDR DIP SOLD TO PCB 2X5		29	P	EA	3.00	1.000	31/10/91	99/99/99	
454315008	HDR DIP SOLD TO PCB 2X4		28	P	EA	2.00	1.000	31/10/91	99/99/99	
454320096	HDR DIP SOLD TO FEM 96		30	P	EA	1.00	1.000	00/00/00	99/99/99	
454340002	HDR MALE PIN TO WW 02		31	P	EA	3.00	1.000	00/00/00	99/99/99	
454390002	HDR FRICTION LOCK 2-PIN		32	P	EA	1.00	1.000	00/00/00	99/99/99	
550430105	SCREW CYL HD PHIL M3X5		1005	P	EA	8.00	1.000	05/11/91	01/01/97	
550430706	SCREW ECO-FIX M3X6		1006	P	EA	8.00	1.000	27/03/92	99/99/99	
554435401	RIVET "RIVSCREW" M 3.5		236	P	EA	7.00	1.000	00/00/00	99/99/99	
585252236	RIVET HOLLOW 2.5X6MM		237	P	EA	2.00	1.000	00/00/00	99/99/99	
709310321	M/CARD 9310-3 U/COVER SHIELD	A	1002	B	EA	1.00	1.000	05/11/91	01/01/97	
709314331	MAIN CARD U/SEP SHIELD	A	1003	B	EA	4.00	1.000	05/11/91	01/01/97	
7093XX331	MAIN CARD BNC SPACER	B	1001	B	EA	4.00	1.000	05/11/91	01/01/97	
709450321	HEAT SINK FOR FADC	A	238	B	EA	3.00	1.000	00/00/00	99/99/99	
719314303	PC BD PREASS'Y 9314-3	G	239	B	EA	1.00	1.000	00/00/00	99/99/99	
FP9310-3	MAIN CARD PANEL 9310-3	A	1000	R	EA	1.00	1.000	00/00/00	01/01/97	
HSH410	HYB SAMPLE & HOLD HSH410	C	33	B	EA	2.00	1.000	00/00/00	99/99/99	
MCL404	IC MEM GATE ARRAY MCL404		34	P	EA	1.00	1.000	00/00/00	99/99/99	
MDX407	IC DEMULTIPLEXER MDX407		35	P	EA	2.00	1.000	00/00/00	99/99/99	
MFE409	MONOL. DSO FRONT END (500MHZ)		36	B	EA	2.00	1.000	00/00/00	99/99/99	
MST412	IC SMART TRIGGER GATE-ARRAY	A	37	B	EA	1.00	1.000	00/00/00	99/99/99	
MTB411	IC TIME BASE GATE-ARRAY	A	38	B	EA	1.00	1.000	00/00/00	99/99/99	
MTR408	TRIGGER COUPLING & COMPARATOR		39	B	EA	2.00	1.000	00/00/00	99/99/99	
SM158043006	CAP VARIABLE 2 - 6 PF		40	P	EA	1.00	1.000	00/00/00	99/99/99	

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: S9310-3
DESC: COMMON PARTS FOR 9310-3 UOM: EA SC: R REV: F

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
SM158240200	CAP VARIABLE .6 - 2.5 PF		41	P	EA	1.00	1.000	00/00/00	99/99/99	
SM168651297	RES METAL FILM 1% 100 OHMS		42	P	EA	4.00	1.000	00/00/00	99/99/99	
SM168659004	RES METAL FILM .1% 900 OHMS		43	P	EA	1.00	1.000	00/00/00	99/99/99	
SM168659006	RES METAL FILM .1% 111.1 K		44	P	EA	1.00	1.000	00/00/00	99/99/99	
SM168659007	RES METAL FILM .1% 3.00K		45	P	EA	1.00	1.000	00/00/00	99/99/99	
SM168659297	RES METAL FILM .1% 100 OHMS		46	P	EA	3.00	1.000	00/00/00	99/99/99	
SM185457101	RES VARI CERMET 100 OHMS		47	P	EA	1.00	1.000	00/00/00	99/99/99	
SM185457102	RES VARI CERMET 1 K		48	P	EA	4.00	1.000	00/00/00	99/99/99	
SM185457103	RES VARI CERMET 10 K		49	P	EA	4.00	1.000	00/00/00	99/99/99	
SM185457203	RES VARI CERMET 20 K		50	P	EA	6.00	1.000	00/00/00	99/99/99	
SM200167102	IC NOR GATE 10H102		51	P	EA	1.00	1.000	00/00/00	99/99/99	
SM200167103	IC 2-INP OR GATE 10H103		52	P	EA	1.00	1.000	00/00/00	99/99/99	
SM200167105	IC 2-3-2 OR/NOR 10H105		53	P	EA	4.00	1.000	00/00/00	99/99/99	
SM200167121	IC OR-AND/O-A-INV 10H121		54	P	EA	1.00	1.000	00/00/00	99/99/99	
SM200167131	IC M-S TYP D FLOP 10H131		55	P	EA	5.00	1.000	00/00/00	99/99/99	
SM200176002	IC 2-IN NOR HC02		56	P	EA	1.00	1.000	00/00/00	99/99/99	
SM200178000	IC 2-INPUT NAND HCT00		57	P	EA	1.00	1.000	00/00/00	99/99/99	
SM200178002	IC 2-INPUT NOR HCT02		58	P	EA	1.00	1.000	00/00/00	99/99/99	
SM200178020	IC 4-IN NAND HCT20		59	P	EA	1.00	1.000	00/00/00	99/99/99	
SM200178074	IC D-TYP FLOP 74HCT74		60	P	EA	1.00	1.000	19/12/91	99/99/99	
SM200178138	IC 3-8 LINE DECOD HCT 138		61	P	EA	3.00	1.000	00/00/00	99/99/99	
SM200178139	IC 2-TO-4-LINE DEC HCT139		62	P	EA	1.00	1.000	00/00/00	99/99/99	
SM200178374	IC D-TYP FLOP 74HCT374		63	P	EA	1.00	1.000	00/00/00	99/99/99	
SM200179374	IC OCTAL D-TYP F-F 74BCT374		64	P	EA	2.00	1.000	00/00/00	99/99/99	
SM200267016	IC BINARY COUNTER 10H016		65	P	EA	1.00	1.000	00/00/00	99/99/99	
SM200278040	IC COUNTER HCT4040		66	P	EA	1.00	1.000	00/00/00	99/99/99	
SM201177000	IC 2-IN NAND 74ACT00		67	P	EA	1.00	1.000	00/00/00	99/99/99	
SM201177004	IC HEX INVERTER 74ACT04		68	P	EA	1.00	1.000	00/00/00	99/99/99	
SM201177008	IC 4X2 INPUT AND 74ACT08		69	P	EA	2.00	1.000	19/12/91	99/99/99	
SM201177109	IC DUAL FLPO 74ACT109		70	P	EA	2.00	1.000	19/12/91	99/99/99	
SM205617594	IC 8-BIT SHIFT REG 74HC594		71	P	EA	8.00	1.000	00/00/00	99/99/99	
SM205618165	IC 8-BIT SHIFT REG 74HCT165		72	P	EA	1.00	1.000	00/00/00	99/99/99	
SM206886623	IC OCTAL BUS TRANSCVR. BCT623		73	P	EA	6.00	1.000	00/00/00	99/99/99	
SM207130025	TRANSISTOR NPN BFT25A		74	P	EA	1.00	1.000	00/00/00	99/99/99	
SM207178541	IC BUFFER/LINE DR HCT541		75	P	EA	4.00	1.000	00/00/00	99/99/99	
SM207360125	IC TRANSLATO MC10125		76	P	EA	7.00	1.000	31/10/91	99/99/99	
SM207460116	IC LINE RECEIVER 10H116		77	P	EA	6.00	1.000	00/00/00	99/99/99	
SM207480823	IC 9-BIT BUS INT FF 74BCT29823		78	P	EA	2.00	1.000	00/00/00	99/99/99	
SM207770201	IC ANALOG SWITCH DG201		79	P	EA	4.00	1.000	00/00/00	99/99/99	
SM207770403	IC ANALOG SWITCH DG403		80	P	EA	2.00	1.000	00/00/00	99/99/99	
SM207770442	IC ANALOG SWITCH DG442		81	P	EA	3.00	1.000	00/00/00	99/99/99	
SM207878245	IC BUS TRANSCVR HCT 245		82	P	EA	4.00	1.000	00/00/00	99/99/99	
SM207978153	IC 4-INPUT MUX HCT153		83	P	EA	1.00	1.000	00/00/00	99/99/99	
SM207978251	IC 8-IN MUX 3-ST 74HCT251		84	P	EA	1.00	1.000	00/00/00	99/99/99	
SM208030245	IC TRANS ARRAY NPNX6 SL3245		244	P	EA	1.00	1.000	31/10/91	99/99/99	
SM208470324	IC OP AMP LM324M		85	P	EA	2.00	1.000	00/00/00	99/99/99	
SM208470347	IC J-FET OP AMP 347		86	P	EA	4.00	1.000	00/00/00	99/99/99	
SM208470353	IC DUAL OP AMP 353		87	P	EA	2.00	1.000	20/09/91	99/99/99	
SM208470358	IC DUAL OP AMP 358D		241	P	EA	1.00	1.000	20/09/91	99/99/99	
SM208470705	IC OP AMP PICOAMP INPUT AD705		88	P	EA	4.00	1.000	00/00/00	99/99/99	
SM208580336	IC REF DIODE LM336-2.5V		89	P	EA	1.00	1.000	00/00/00	99/99/99	

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: S9310-3
DESC: COMMON PARTS FOR 9310-3 UOM: EA SC: R REV: F

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
SM208765041	IC 8-BIT AD SERIAL MC145041		90	P	EA	1.00	1.000	00/00/00	99/99/99	
SM208870339	IC VOLT COMPARATOR 339		91	P	EA	2.00	1.000	00/00/00	99/99/99	
SM208971881	IC VIDEO SYNC SEPARATOR LM1881		92	P	EA	1.00	1.000	00/00/00	99/99/99	
SM232022822	DIODE ARRAY SCHTTKY 2822		93	P	EA	1.00	1.000	00/00/00	99/99/99	
SM232120070	DIODE ARRAY BAV70		94	P	EA	2.00	1.000	00/00/00	99/99/99	
SM234101385	DIODE VOLT REG 385-1.2		95	P	EA	1.00	1.000	00/00/00	99/99/99	
SM236030099	DIODE SO-PKG BAV99		96	P	EA	9.00	1.000	31/10/91	99/99/99	
SM236654004	DIODE RECTIFIER 4004		97	P	EA	1.00	1.000	00/00/00	99/99/99	
SM240050033	DIODE ZENER TZM-C-3V3		98	P	EA	3.00	1.000	00/00/00	99/99/99	
SM240050051	DIODE ZENER TZM-C-5V1		99	P	EA	2.00	1.000	00/00/00	99/99/99	
SM252023018	DIODE PIN BAT 18		100	P	EA	3.00	1.000	00/00/00	99/99/99	
SM252080682	DIODE PIN BA682		101	P	EA	5.00	1.000	00/00/00	99/99/99	
SM253032821	DIODE SCHOTTKY 2821		102	P	EA	1.00	1.000	00/00/00	99/99/99	
SM270030020	TRANSISTOR NPN BFS20		103	P	EA	1.00	1.000	00/00/00	99/99/99	
SM270130092	TRANSISTOR NPN BFR92A		104	P	EA	16.00	1.000	31/10/91	99/99/99	
SM270130093	TRANSISTOR NPN BFR93A		105	P	EA	1.00	1.000	00/00/00	99/99/99	
SM270140092	TRANSISTOR NPN BFR92AR		106	P	EA	1.00	1.000	31/10/91	99/99/99	
SM270330848	TRANSISTOR NPN BC848C		107	P	EA	3.00	1.000	31/10/91	99/99/99	
SM275030092	TRANSISTOR PNP BFT92		108	P	EA	9.00	1.000	19/12/91	99/99/99	
SM275030093	TRANSISTOR PNP BFT93		253	P	EA	2.00	1.000	19/12/91	99/99/99	
SM275030550	TRANSISTOR PNP BF550		109	P	EA	1.00	1.000	00/00/00	99/99/99	
SM275040093	TRANSISTOR PNP BFT93R		111	P	EA	4.00	1.000	00/00/00	99/99/99	
SM275040550	TRANSISTOR PNP BF550R		112	P	EA	1.00	1.000	00/00/00	99/99/99	
SM275330858	TRANSISTOR PNP BC858C		113	P	EA	7.00	1.000	00/00/00	99/99/99	
SM289240062	TRANSISTOR ARRAY BCV62		115	P	EA	3.00	1.000	00/00/00	99/99/99	
SM289772003	TRANSISTOR ARRAY 2003		116	P	EA	2.00	1.000	00/00/00	99/99/99	
SM300446150	INDUCTOR .015UH		117	P	EA	1.00	1.000	00/00/00	99/99/99	
SM300486104	INDUCTOR WOUND 100uH		118	P	EA	2.00	1.000	00/00/00	99/99/99	
SM300546151	INDUCTOR .15 UH		119	P	EA	1.00	1.000	00/00/00	99/99/99	
SM301502001	BEAD (FERRITE CHIP)		120	P	EA	26.00	1.000	00/00/00	99/99/99	
SM651104151	RES CHIP 1% 25 PPM 150 OHMS		122	P	EA	1.00	1.000	00/00/00	99/99/99	
SM651104182	RES CHIP 1% 25PPM 1.8K		123	P	EA	1.00	1.000	00/00/00	99/99/99	
SM651104183	RES CHIP 1% 25PPM 18 K		126	P	EA	1.00	1.000	27/03/92	99/99/99	
SM651104204	RES CHIP 1% 25PPM 200 K		121	P	EA	1.00	1.000	04/10/91	99/99/99	
SM651104391	RES CHIP 1% 25PPM 390 OHMS		124	P	EA	1.00	1.000	27/03/92	99/99/99	
SM651104392	RES CHIP 1% 25PPM 3.9K		125	P	EA	1.00	1.000	27/03/92	99/99/99	
SM652101100	RES CHIP (E24) 1% 10 OHMS		127	P	EA	13.00	1.000	19/12/91	99/99/99	
SM652101101	RES CHIP (E24) 1% 100 OHM		128	P	EA	26.00	1.000	19/12/91	99/99/99	
SM652101102	RES CHIP (E24) 1% 1 K		114	P	EA	5.00	1.000	16/06/92	99/99/99	
SM652101102	RES CHIP (E24) 1% 1 K		129	P	EA	5.00	1.000	16/06/92	99/99/99	
SM652101103	RES CHIP (E24) 1% 10 K		130	P	EA	55.00	1.000	19/12/91	99/99/99	
SM652101104	RES CHIP (E24) 1% 100 K		131	P	EA	2.00	1.000	00/00/00	99/99/99	
SM652101105	RES CHIP (E24) 1% 1 M		132	P	EA	8.00	1.000	31/10/91	99/99/99	
SM652101106	RES CHIP (E24) 1% 10 MEG		133	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101111	RES CHIP (E24) 1% 110 OHM		134	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101114	RES CHIP (E24) 1% 110 K		135	P	EA	2.00	1.000	00/00/00	99/99/99	
SM652101120	RES CHIP (E24) 1% 12 OHMS		136	P	EA	2.00	1.000	19/12/91	99/99/99	
SM652101121	RES CHIP (E24) 1% 120 OHM		137	P	EA	1.00	1.000	23/01/92	99/99/99	
SM652101122	RES CHIP (E24) 1% 1.2 K		138	P	EA	9.00	1.000	00/00/00	99/99/99	
SM652101131	RES CHIP (E24) 1% 130 OHM		139	P	EA	3.00	1.000	31/10/91	99/99/99	
SM652101151	RES CHIP (E24) 1% 150 OHM		140	P	EA	13.00	1.000	27/03/92	99/99/99	

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: S9310-3
DESC: COMMON PARTS FOR 9310-3 UOM: EA SC: R REV: F

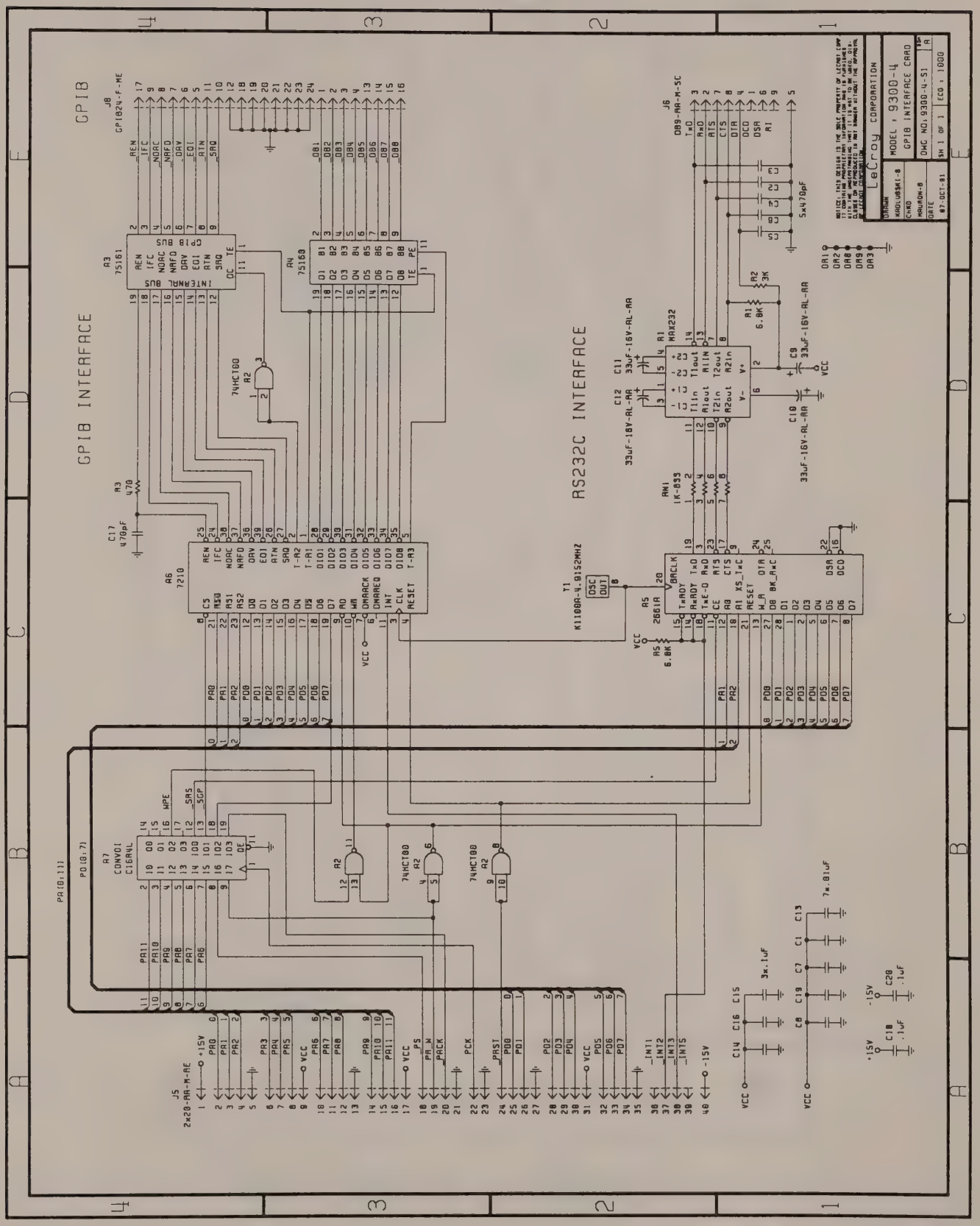
COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
SM652101152	RES CHIP (E24) 1% 1.5 K		141	P	EA	12.00	1.000	27/03/92	99/99/99	
SM652101153	RES CHIP (E24) 1% 15 K		142	P	EA	2.00	1.000	00/00/00	99/99/99	
SM652101163	RES CHIP (E24) 1% 16 K		144	P	EA	2.00	1.000	00/00/00	99/99/99	
SM652101180	RES CHIP (E24) 1% 18 OHMS		145	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101181	RES CHIP (E24) 1% 180 OHM		245	P	EA	5.00	1.000	31/10/91	99/99/99	
SM652101182	RES CHIP (E24) 1% 1.8 K		146	P	EA	4.00	1.000	23/01/92	99/99/99	
SM652101185	RES CHIP (E24) 1% 1.8 M		148	P	EA	2.00	1.000	00/00/00	99/99/99	
SM652101200	RES CHIP (E24) 1% 20 OHMS		251	P	EA	4.00	1.000	31/10/91	99/99/99	
SM652101201	RES CHIP (E24) 1% 200 OHM		149	P	EA	6.00	1.000	31/10/91	99/99/99	
SM652101202	RES CHIP (E24) 1% 2 K		150	P	EA	7.00	1.000	19/12/91	99/99/99	
SM652101220	RES CHIP (E24) 1% 22 OHMS		252	P	EA	3.00	1.000	19/12/91	99/99/99	
SM652101221	RES CHIP (E24) 1% 220 OHM		151	P	EA	6.00	1.000	31/10/91	99/99/99	
SM652101222	RES CHIP (E24) 1% 2.2 K		152	P	EA	5.00	1.000	23/01/92	99/99/99	
SM652101223	RES CHIP (E24) 1% 22 K		153	P	EA	3.00	1.000	27/03/92	99/99/99	
SM652101240	RES CHIP (E24) 1% 24 OHMS		154	P	EA	10.00	1.000	23/01/92	99/99/99	
SM652101241	RES CHIP (E24) 1% 240 OHM		155	P	EA	4.00	1.000	31/10/91	99/99/99	
SM652101242	RES CHIP (E24) 1% 2.4 K		156	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101243	RES CHIP (E24) 1% 24 K		157	P	EA	2.00	1.000	27/03/92	99/99/99	
SM652101271	RES CHIP (E24) 1% 270 OHM		246	P	EA	6.00	1.000	31/10/91	99/99/99	
SM652101272	RES CHIP (E24) 1% 2.7 K		159	P	EA	5.00	1.000	19/12/91	99/99/99	
SM652101273	RES CHIP (E24) 1% 27 K		160	P	EA	4.00	1.000	00/00/00	99/99/99	
SM652101300	RES CHIP (E24) 1% 30 OHMS		161	P	EA	2.00	1.000	31/10/91	99/99/99	
SM652101301	RES CHIP (E24) 1% 300 OHM		162	P	EA	6.00	1.000	27/03/92	99/99/99	
SM652101302	RES CHIP (E24) 1% 3 K		163	P	EA	3.00	1.000	27/03/92	99/99/99	
SM652101330	RES CHIP (E24) 1% 33 OHMS		164	P	EA	3.00	1.000	31/10/91	99/99/99	
SM652101331	RES CHIP (E24) 1% 330 OHM		165	P	EA	15.00	1.000	31/10/91	99/99/99	
SM652101332	RES CHIP (E24) 1% 3.3 K		166	P	EA	12.00	1.000	00/00/00	99/99/99	
SM652101333	RES CHIP (E24) 1% 33 K		167	P	EA	2.00	1.000	00/00/00	99/99/99	
SM652101334	RES CHIP (E24) 1% 330 K		168	P	EA	3.00	1.000	00/00/00	99/99/99	
SM652101360	RES CHIP (E24) 1 % 36 OHM		247	P	EA	2.00	1.000	31/10/91	99/99/99	
SM652101361	RES CHIP (E24) 1% 360 OHM		169	P	EA	2.00	1.000	00/00/00	99/99/99	
SM652101390	RES CHIP (E24) 1% 39 OHMS		170	P	EA	7.00	1.000	00/00/00	99/99/99	
SM652101391	RES CHIP (E24) 1% 390 OHM		171	P	EA	10.00	1.000	19/12/91	99/99/99	
SM652101392	RES CHIP (E24) 1% 3.9 K		172	P	EA	4.00	1.000	19/12/91	99/99/99	
SM652101470	RES CHIP (E24) 47 OHMS		174	P	EA	5.00	1.000	23/01/92	99/99/99	
SM652101471	RES CHIP (E24) 1% 470 OHM		175	P	EA	44.00	1.000	31/10/91	99/99/99	
SM652101472	RES CHIP (E24) 1% 4.7 K		176	P	EA	1.00	1.000	31/10/91	99/99/99	
SM652101474	RES CHIP (E24) 1% 470 K		177	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101475	RES CHIP (E24) 1% 4.7 M		178	P	EA	4.00	1.000	00/00/00	99/99/99	
SM652101510	RES CHIP (E24) 1% 51 OHMS		179	P	EA	21.00	1.000	31/10/91	99/99/99	
SM652101511	RES CHIP (E24) 1% 510 OHM		180	P	EA	6.00	1.000	00/00/00	99/99/99	
SM652101512	RES CHIP (E24) 1% 5.1 K		181	P	EA	23.00	1.000	31/10/91	99/99/99	
SM652101513	RES CHIP (E24) 1% 51 K		182	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101560	RES CHIP (E24) 1% 56 OHM		183	P	EA	10.00	1.000	19/12/91	99/99/99	
SM652101561	RES CHIP (E24) 1% 560 OHM		184	P	EA	5.00	1.000	31/10/91	99/99/99	
SM652101562	RES CHIP (E24) 1% 5.6 K		185	P	EA	5.00	1.000	27/03/92	99/99/99	
SM652101621	RES CHIP (E24) 1% 620 OHM		186	P	EA	3.00	1.000	00/00/00	99/99/99	
SM652101622	RES CHIP (E24) 1% 6.2 K		187	P	EA	3.00	1.000	00/00/00	99/99/99	
SM652101623	RES CHIP (E24) 1% 62 K		173	P	EA	1.00	1.000	16/06/92	99/99/99	
SM652101623	RES CHIP (E24) 1% 62 K		188	P	EA	1.00	1.000	16/06/92	99/99/99	
SM652101680	RES CHIP (E24) 1% 68 OHMS		189	P	EA	34.00	1.000	31/10/91	99/99/99	

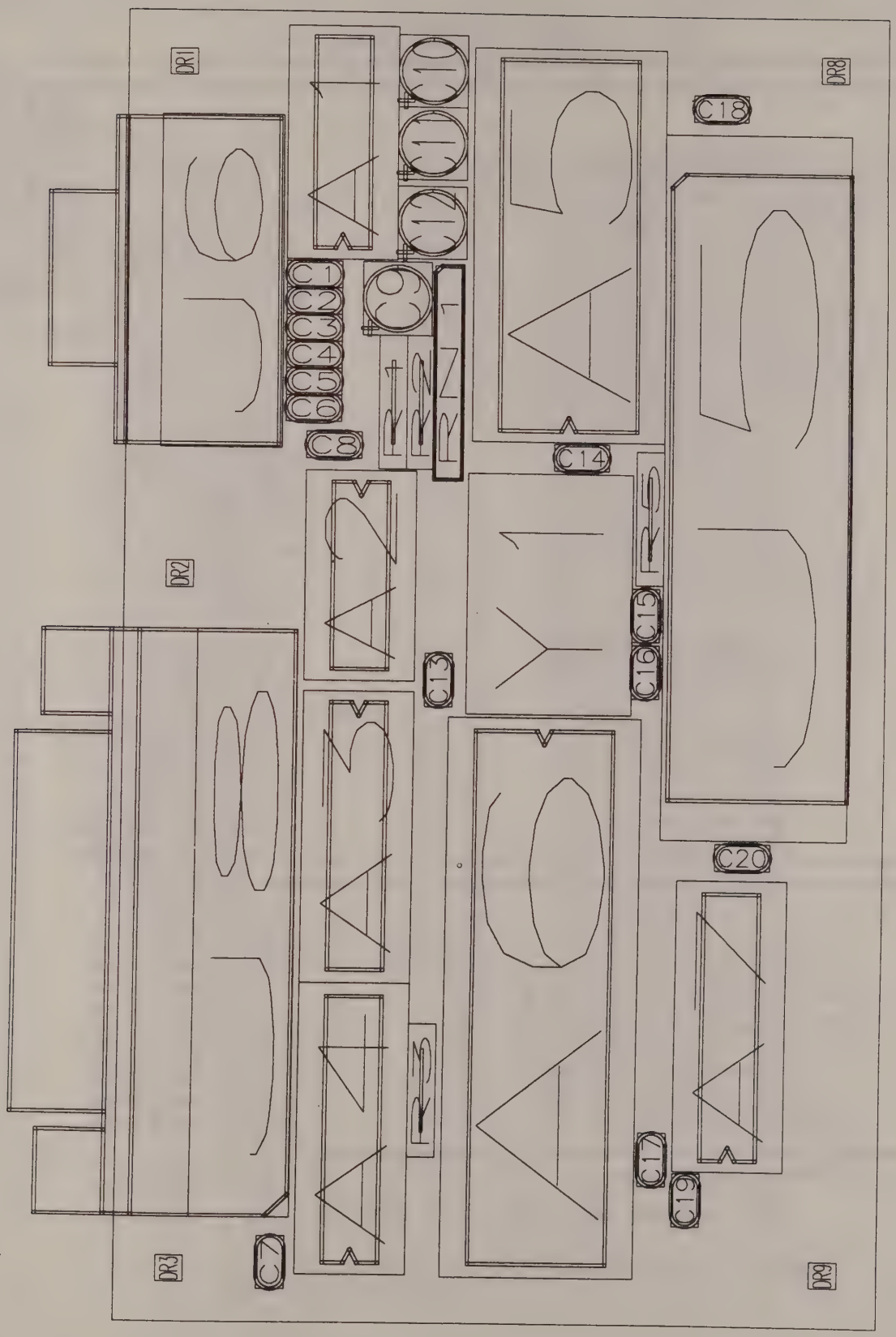
BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

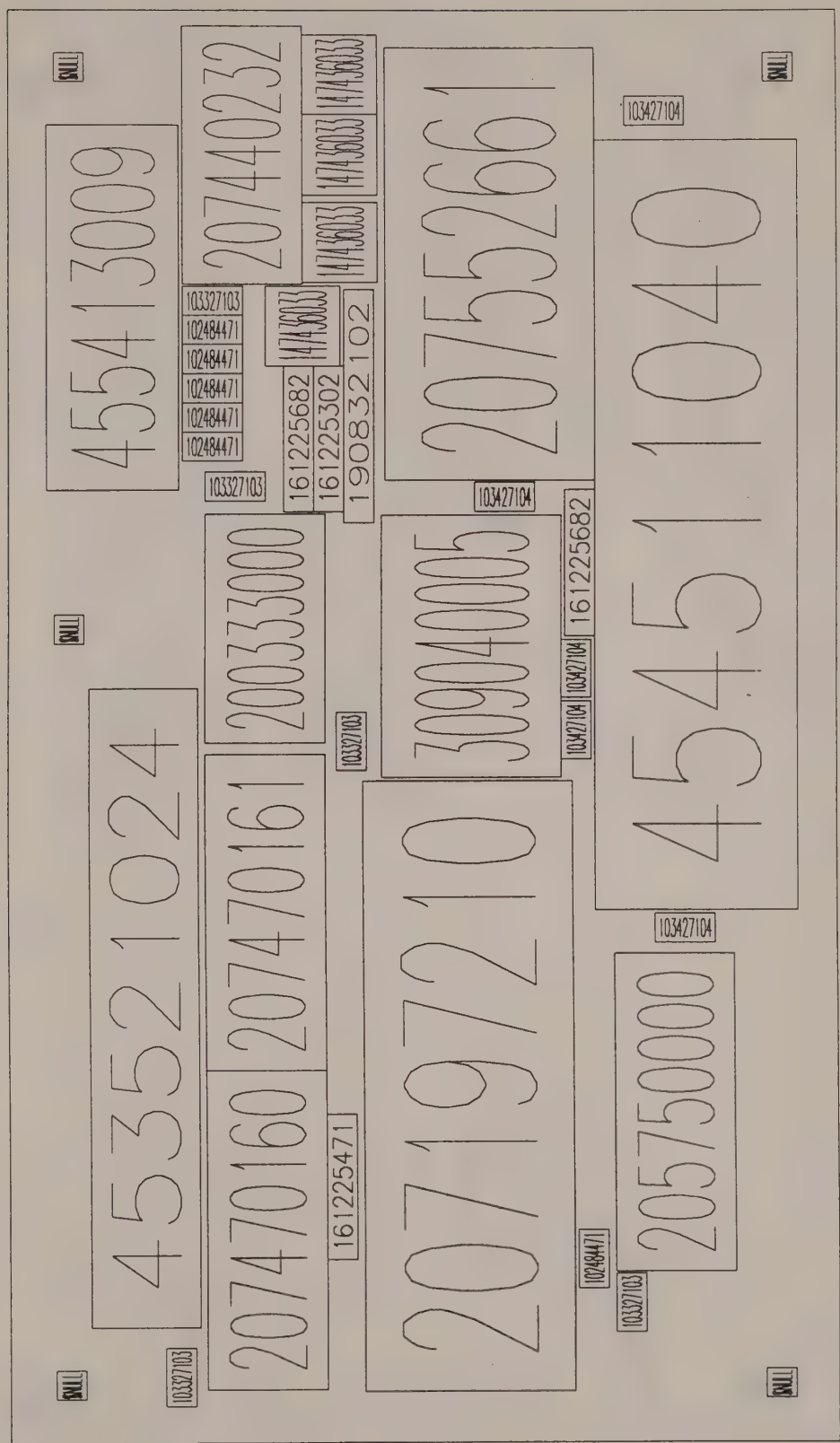
CLASS CODE: 2
SUBASSEMBLIES
PART: S9310-3
DESC: COMMON PARTS FOR 9310-3 UOM: EA SC: R REV: F

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
SM652101681	RES CHIP (E24) 1% 680 OHM		190	P	EA	3.00	1.000	31/10/91	99/99/99	
SM652101683	RES CHIP (E24) 1% 68 K		191	P	EA	2.00	1.000	31/10/91	99/99/99	
SM652101684	RES CHIP (E24) 1% 680 K		192	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101750	RES CHIP (E24) 1% 75 OHMS		193	P	EA	8.00	1.000	00/00/00	99/99/99	
SM652101751	RES CHIP (E24) 1% 750 OHM		194	P	EA	8.00	1.000	00/00/00	99/99/99	
SM652101820	RES CHIP (E24) 1% 82 OHMS		195	P	EA	3.00	1.000	31/10/91	99/99/99	
SM652101821	RES CHIP (E24) 1% 820 OHM		196	P	EA	5.00	1.000	00/00/00	99/99/99	
SM652101822	RES CHIP (E24) 1% 8.2 K		197	P	EA	2.00	1.000	00/00/00	99/99/99	
SM652101824	RES CHIP (E24) 1% 820 K		198	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101910	RES CHIP (E24) 1% 91 OHMS		199	P	EA	1.00	1.000	31/10/91	99/99/99	
SM652101912	RES CHIP (E24) 1% 9.1 K		200	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101913	RES CHIP (E24) 1% 91 K		201	P	EA	2.00	1.000	00/00/00	99/99/99	
SM652110904	RES CHIP 900K 0.5%		202	P	EA	5.00	1.000	00/00/00	99/99/99	
SM652113523	RES CHIP (24) 0.3% 52.63 K		203	P	EA	2.00	1.000	00/00/00	99/99/99	
SM652113954	RES CHIP (E24) 0.3% 950 K		204	P	EA	2.00	1.000	00/00/00	99/99/99	
SM653185100	RES THICK FILM 10 OHMS		254	P	EA	2.00	1.000	19/12/91	99/99/99	
SM653185560	RES THICK FILM 56 OHMS		205	P	EA	1.00	1.000	00/00/00	99/99/99	
SM654101000	CHIP JUMPER ZERO OHMS		206	P	EA	5.00	1.000	19/12/91	99/99/99	
SM661127104	CAP CERA CHIP 20% .1 UF		207	P	EA	12.00	1.000	31/10/91	99/99/99	
SM661205822	CAP CERA CHIP 8200PF		208	P	EA	2.00	1.000	00/00/00	99/99/99	
SM661207103	CAP CERA CHIP 20% .01UF		209	P	EA	269.00	1.000	19/12/91	99/99/99	
SM661207223	CAP CERA CHIP 20% .022 UF		210	P	EA	2.00	1.000	00/00/00	99/99/99	
SM661250047	CAP CERA CHIP 4.7 PF		211	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661250082	CAP CERA CHIP .1% 8.2 PF		212	P	EA	1.00	1.000	19/12/91	99/99/99	
SM661255012	CAP CERA CHIP 5% 1.2 PF		213	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661255027	CAP CERA CHIP 2.7 PF		214	P	EA	3.00	1.000	19/12/91	99/99/99	
SM661255033	CAP CERA CHIP 3.3 PF		215	P	EA	1.00	1.000	31/10/91	99/99/99	
SM661255056	CAP CERA CHIP 5.6 PF		216	P	EA	4.00	1.000	27/03/92	99/99/99	
SM661255068	CAP CERA CHIP 6.8 PF		256	P	EA	2.00	1.000	23/01/92	99/99/99	
SM661255100	CAP CERA CHIP 10PF		217	P	EA	3.00	1.000	00/00/00	99/99/99	
SM661255101	CAP CERA CHIP 5% 100 PF		218	P	EA	4.00	1.000	19/12/91	99/99/99	
SM661255181	CAP CERA CHIP 5% 180 PF		250	P	EA	2.00	1.000	31/10/91	99/99/99	
SM661255220	CAP CERA CHIP 5% 22 PF		219	P	EA	2.00	1.000	19/12/91	99/99/99	
SM661255270	CAP CERA CHIP 27PF		220	P	EA	7.00	1.000	19/12/91	99/99/99	
SM661255331	CAP CERA CHIP 5% 330 PF		221	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661255470	CAP CERA CHIP 47PF		222	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661255560	CAP CERA CHIP 56PF		223	P	EA	2.00	1.000	31/10/91	99/99/99	
SM661255820	CAP CERA CHIP 5% 82 PF		224	P	EA	2.00	1.000	00/00/00	99/99/99	
SM661255821	CAP CERA CHIP 5% 820 PF		225	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661256120	CAP CERA CHIP 10% 12 PF		226	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661446474	CAP CERA CHIP 10% .47 UF		227	P	EA	1.00	1.000	31/10/91	99/99/99	
SM661495561	CAP CERA CHIP 5% 560 PF		228	P	EA	3.00	1.000	00/00/00	99/99/99	
SM661726103	CAP CERA CHIP 10% .01 UF		229	P	EA	8.00	1.000	00/00/00	99/99/99	
SM666237476	CAP MOLD TANT CHIP 47 UF		230	P	EA	7.00	1.000	00/00/00	99/99/99	
SM666247106	CAP MOLD TANT CHIP 10 UF		231	P	EA	10.00	1.000	31/10/91	99/99/99	
SM666317475	CAP MOLD TANT CHIP 4.7 UF		232	P	EA	1.00	1.000	31/10/91	99/99/99	
SM666327225	CAP MOLD TANT CHIP 2.2 UF		233	P	EA	19.00	1.000	00/00/00	99/99/99	
SM666377226	CAP MOLD TANT CHIP 22 UF		234	P	EA	2.00	1.000	00/00/00	99/99/99	
SM666427105	CAP MOLD TANT CHIP 1 UF		235	P	EA	2.00	1.000	00/00/00	99/99/99	

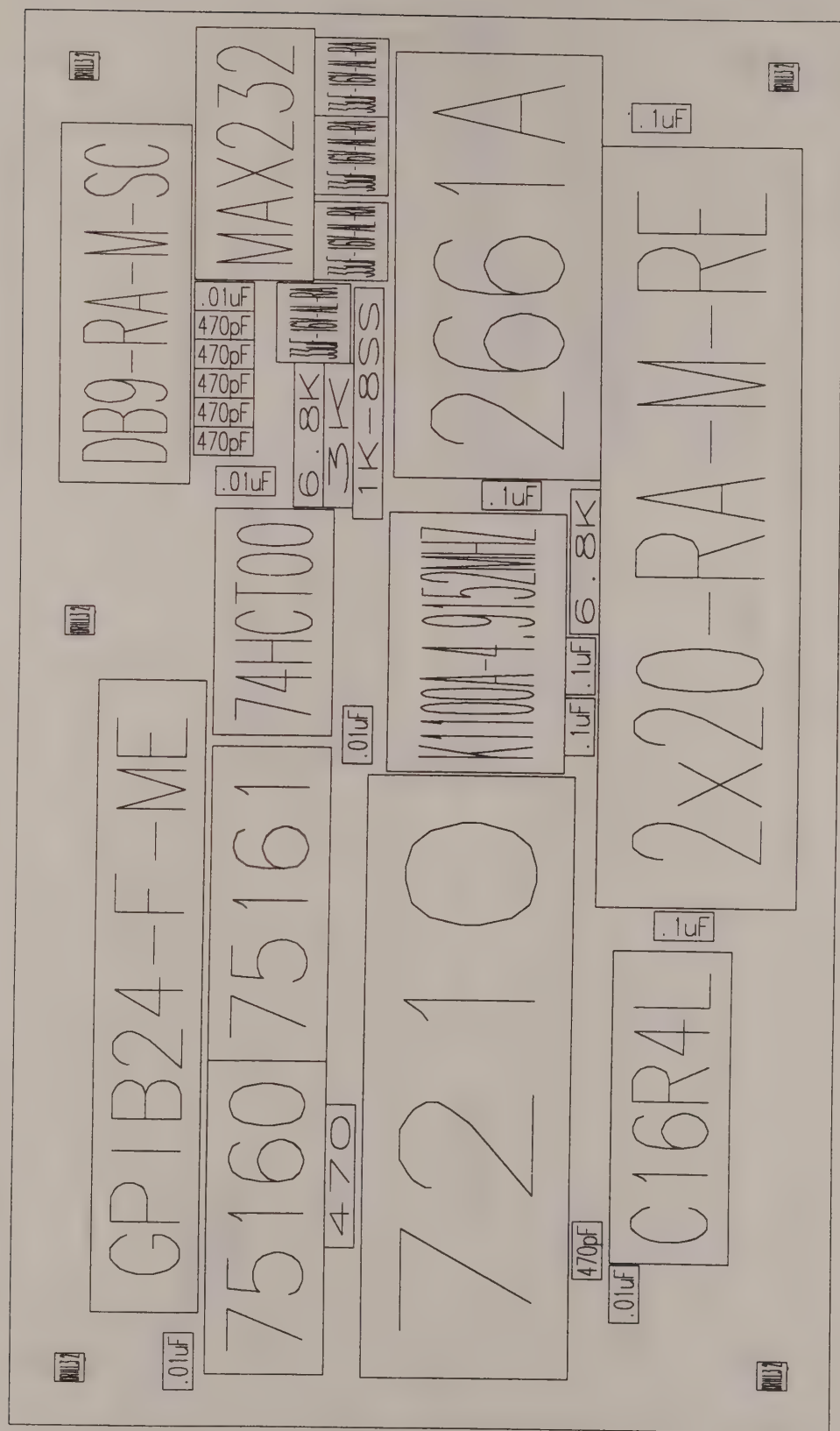

GPIB INTERFACE
RS232C INTERFACE
LeCroy CORPORATION
MODEL : 9300-4
GPIB INTERFACE CARD
DWG NO: 9300-4-S1
SH 1 OF 1
ECO : 1000
DRAWN
KHOLUBSKI-B
CHKD
MAUNOM-B
DATE
07-OCT-91
J8
GPIB24-F-ME
J6
DB9-RA-M-SC
J5
2x20-RA-M-RE
A3
75161
A4
75160
A6
7210
A7
CONVOI
C16AL
74HC100
MAX232
K1100A-4.915MHz
2661A
PA(0:11)
PD(0:7)
GPIB
INTERFACE BUS
REN
IFC
NDAC
NRFD
DAV
EOI
ATN
SRQ
DC
TE
PE
VCC
-15V
+15V


DR1
DR8
C10
C11
C12
C18
C1
C2
C3
C4
C5
C6
C9
R1
R2
R4
C8
C14
DR2
R5
C15
C16
C13
C20
R3
C17
C19
C7
DR3
DR9

9300-4 REV:D


455413009
207440232
207552661
454511040
453521024
207470160
207470161
207197210
309040005
205750000
200333000
161225682
161225302
190832102
161225471
103327103
102484471
103427104

9300-4 REV:D


DB9-RA-M-SC
MAX232
2661A
2X20-RA-M-RE
.1uF
.01uF
470pF
470pF
470pF
470pF
470pF
.01uF
6.8K
3K
1K-8SS
.1uF
6.8K
.1uF
.1uF
74HCT00
.01uF
GPIB24-F-ME
75161
75160
470
7210
.1uF
C16R4L
470pF
.01uF
.01uF

9300-4 REV:D

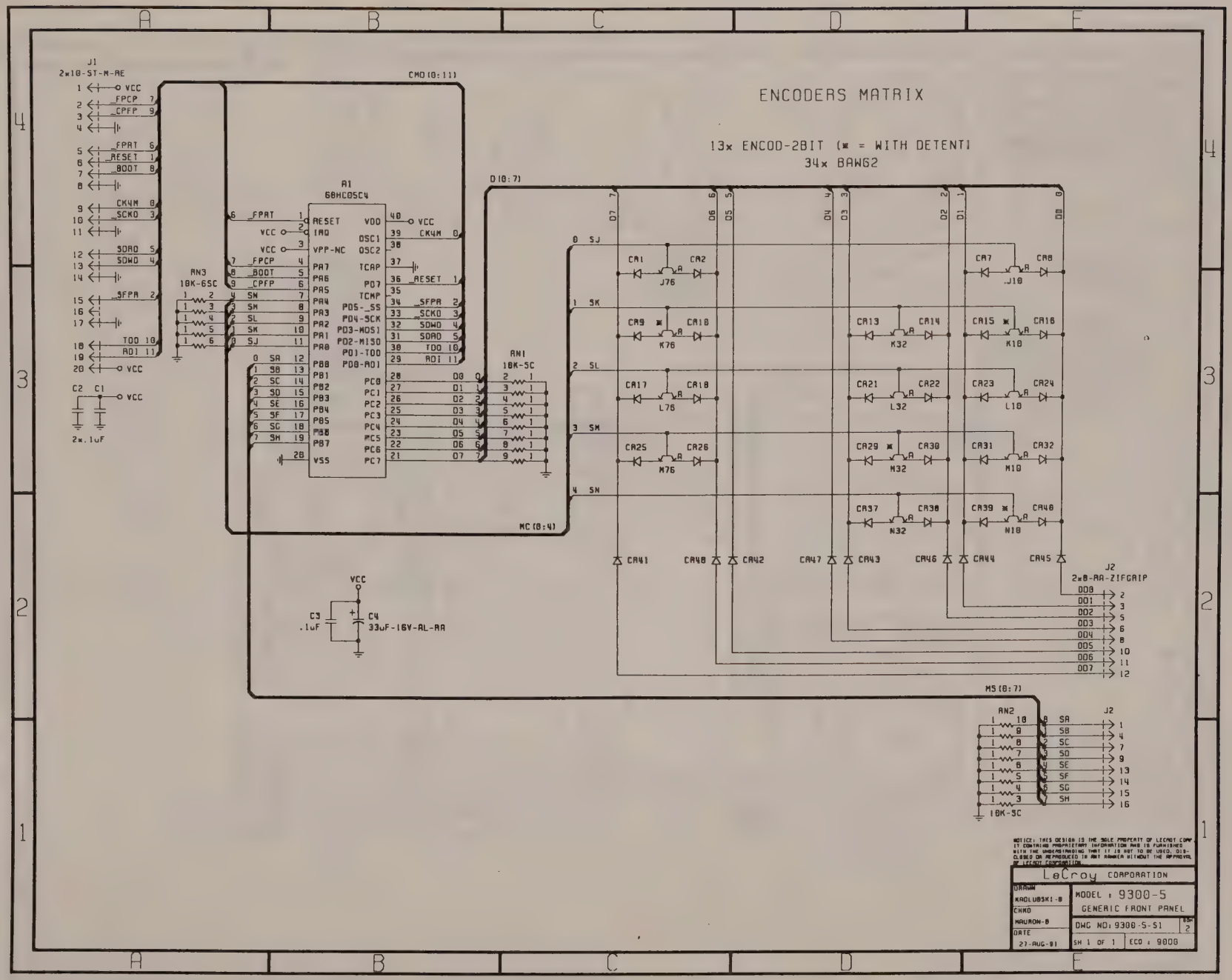
A1	207440232	MAX232	DIP16
A2	200333000	74HCT00	DIP14
A3	207470161	75161	DIP20
A4	207470160	75160	DIP20
A5	207552661	2661A	DIP28
A6	207197210	7210	DIP40
A7	205750000	C16R4L	DIP20
C1	103327103	.01uF	SMONOBP
C2	102484471	470pF	SMONO
C3	102484471	470pF	SMONO
C4	102484471	470pF	SMONO
C5	102484471	470pF	SMONO
C6	102484471	470pF	SMONO
C7	103327103	.01uF	SMONOBP
C8	103327103	.01uF	SMONOBP
C9	147436033	33uF-16V-AL-RA	TCAP
C10	147436033	33uF-16V-AL-RA	TCAP
C11	147436033	33uF-16V-AL-RA	TCAP
C12	147436033	33uF-16V-AL-RA	TCAP
C13	103327103	.01uF	SMONOBP
C14	103427104	.1uF	SMONOBP
C15	103427104	.1uF	SMONOBP
C16	103427104	.1uF	SMONOBP
C17	102484471	470pF	SMONO
C18	103427104	.1uF	SMONOBP
C19	103327103	.01uF	SMONOBP
C20	103427104	.1uF	SMONOBP
J5	454511040	2x20-RA-M-RE	CONN2X20_RA_M_RE
J6	455413009	DB9-RA-M-SC	DB9_RA_M_SC
J8	453521024	GPIB24-F-ME	GPIB24_F_ME
R1	161225682	6.8K	RES05
R2	161225302	3K	RES05
R3	161225471	470	RES05
R5	161225682	6.8K	RES05
RN1	190832102	1K-8SS	SIP8RES
Y1	309040005	K1100A-4.9152MHZ	$1100_QUARTZ

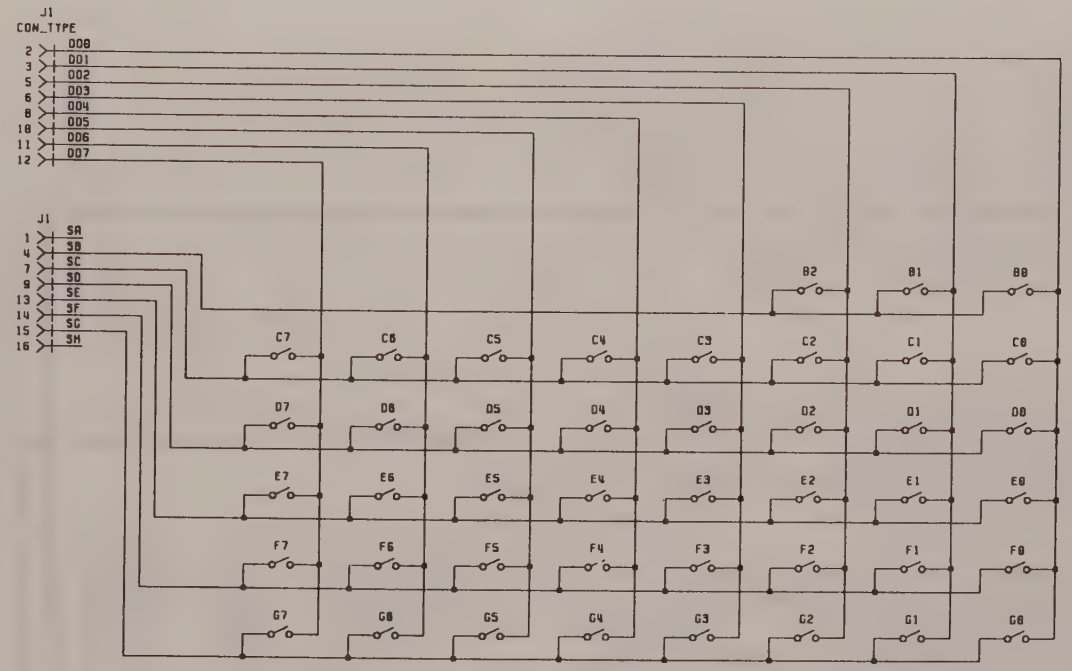
BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: F9300-4
DESC: GPIB + RS232 INTERFACE CARD UOM: EA SC: R REV: A

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
102484471	CAP CERA DISC 100V 470 PF		1	P	EA	6.00	1.000	00/00/00	99/99/99	
103327103	CAP CERA MONO 50V .01 UF		2	P	EA	5.00	1.000	00/00/00	99/99/99	
103427104	CAP CERA MONO 100V .1 UF		3	P	EA	5.00	1.000	00/00/00	99/99/99	
147436033	CAP ALUM METAL CAN 33 UF		4	P	EA	4.00	1.000	00/00/00	99/99/99	
161225302	RES COMP 1/8W 5% 3 K		5	P	EA	1.00	1.000	00/00/00	99/99/99	
161225471	RES COMP 1/8W 5% 470 OHMS		6	P	EA	1.00	1.000	00/00/00	99/99/99	
161225682	RES CARBON FILM 6.8 K		7	P	EA	2.00	1.000	23/08/91	99/99/99	
190832102	RES NETWORK 1 K		8	P	EA	1.00	1.000	00/00/00	99/99/99	
200333000	IC QUAD 2-IN NAND HCT00		9	P	EA	1.00	1.000	00/00/00	99/99/99	
205750000	IC AND-OR GATE ARRAY 16V8		10	P	EA	1.00	1.000	00/00/00	99/99/99	
207197210	IC BUS INTERF CONTR 7210		11	P	EA	1.00	1.000	00/00/00	99/99/99	
207440232	IC XMTR/RCVR MAX 232		12	P	EA	1.00	1.000	00/00/00	99/99/99	
207470160	IC OCTAL BUS XCVR 75160A		13	P	EA	1.00	1.000	00/00/00	99/99/99	
207470161	IC OCTL BUS XCEIR 75161A		14	P	EA	1.00	1.000	00/00/00	99/99/99	
207552661	IC INTERFACE 2661A		15	P	EA	1.00	1.000	00/00/00	99/99/99	
309040005	CRYSTAL OSCIL. 4.9152MHZ		16	P	EA	1.00	1.000	00/00/00	99/99/99	
453521024	CONN RT ANGLE IEEE FEM 24		22	P	EA	1.00	1.000	13/09/91	99/99/99	
454511040	HDR SOLD TAIL/MALE/40/RT		20	P	EA	1.00	1.000	00/00/00	99/99/99	
455413009	CONN RT ANGLE MALE 9 S-CLIP		18	P	EA	1.00	1.000	00/00/00	99/99/99	
455980002	MOUNTING HDW FOR CONN SHELL		21	P	EA	2.00	1.000	18/09/91	99/99/99	
550130108	SCREW CYL HD M3X8		23	P	EA	2.00	1.000	13/09/91	99/99/99	
550430106	SCREW CYL HD PHIL M3X6		1001	P	EA	4.00	1.000	23/08/91	99/99/99	
551430400	WASHER SHAKEPROOF M3		1002	P	EA	4.00	1.000	23/08/91	99/99/99	
709300411	GPIB-RS232 INTERFACE BRACKET	D	1000	B	EA	1.00	1.000	23/08/91	99/99/99	
709300421	LABEL RS232-IEEE488-2	A	1003	B	EA	1.00	1.000	17/11/92	99/99/99	
719300403	PC BD PREASS'Y 9300-4	D	19	B	EA	1.00	1.000	00/00/00	99/99/99	


ENCODERS MATRIX
13x ENCOD-2BIT (* = WITH DETENT)
34x BAW62
J1
2x10-ST-M-RE
A1
68HC05C4
AN1
18K-SC
AN2
18K-SC
AN3
18K-6SC
J2
2x8-RA-ZIFGRIP
C1
C2
2x.1uF
C3
.1uF
C4
33uF-16V-AL-RA
CR1
CR2
J76
CR7
CR8
J10
CR9
CR10
K76
CR13
CR14
K32
CR15
CR16
K10
CR17
CR18
L76
CR21
CR22
L32
CR23
CR24
L10
CR25
CR26
M76
CR29
CR30
M32
CR31
CR32
M10
CR37
CR38
N32
CR39
CR40
N10
CR41
CR48
CR42
CR47
CR43
CR46
CR44
CR45
D(8:7)
MC(8:4)
MS(8:7)
LeCroy CORPORATION
MODEL : 9300-5
GENERIC FRONT PANEL
DWG NO: 9300-S-S1
SH 1 OF 1
ECO : 9808
DRAWN
KAOLUBSKI-B
CHKD
MAURON-B
DATE
27-AUG-91



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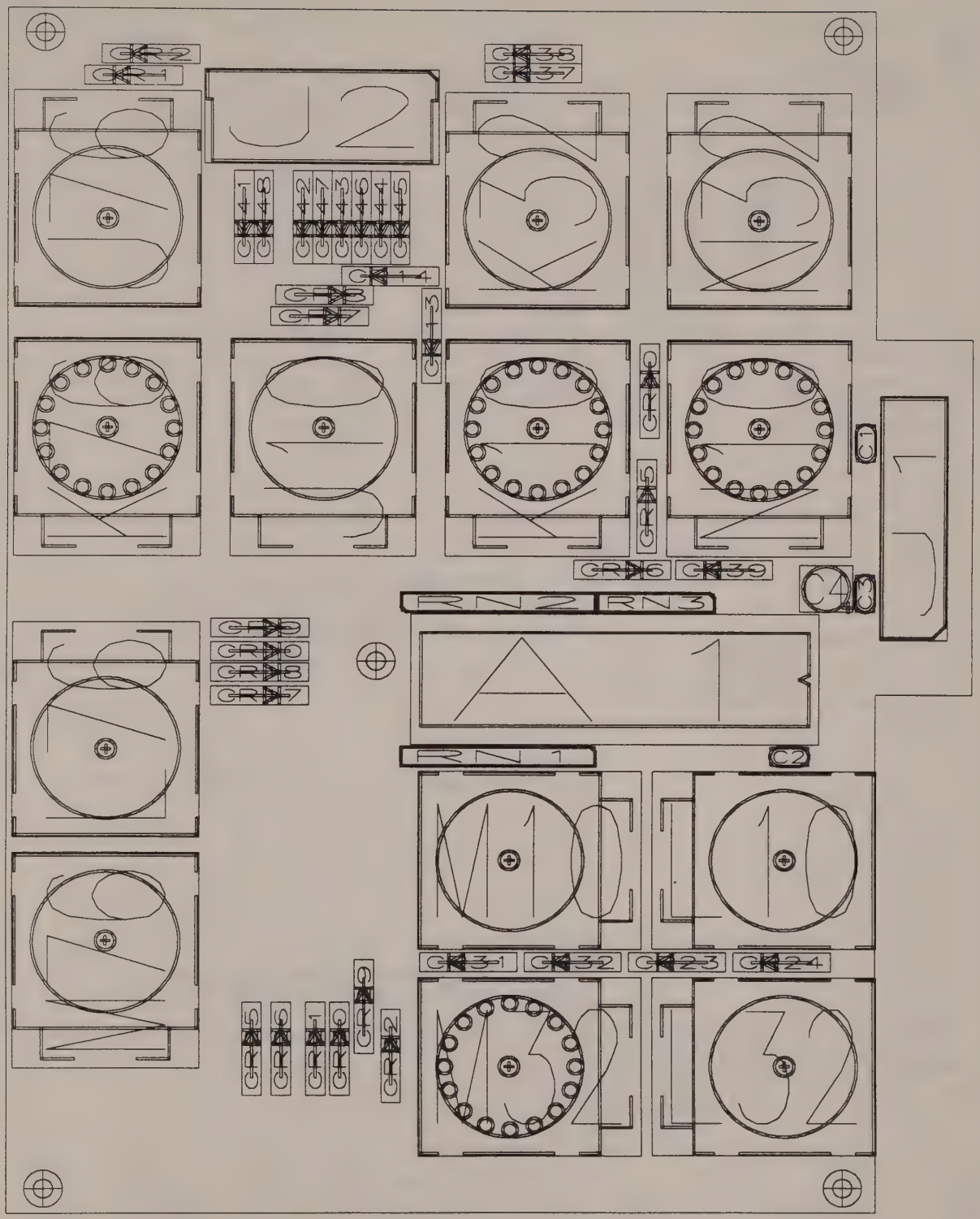
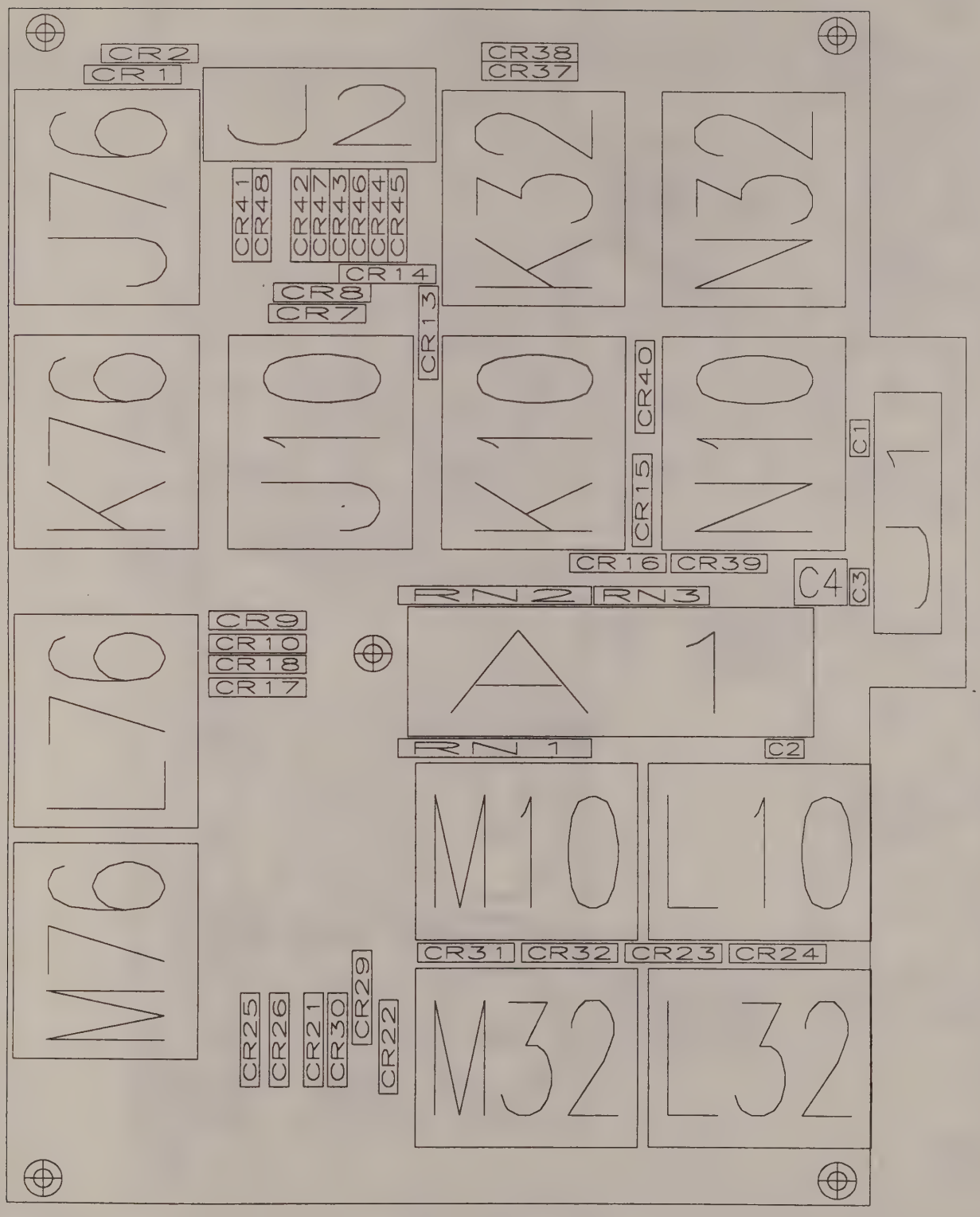
LeCroy CORPORATION

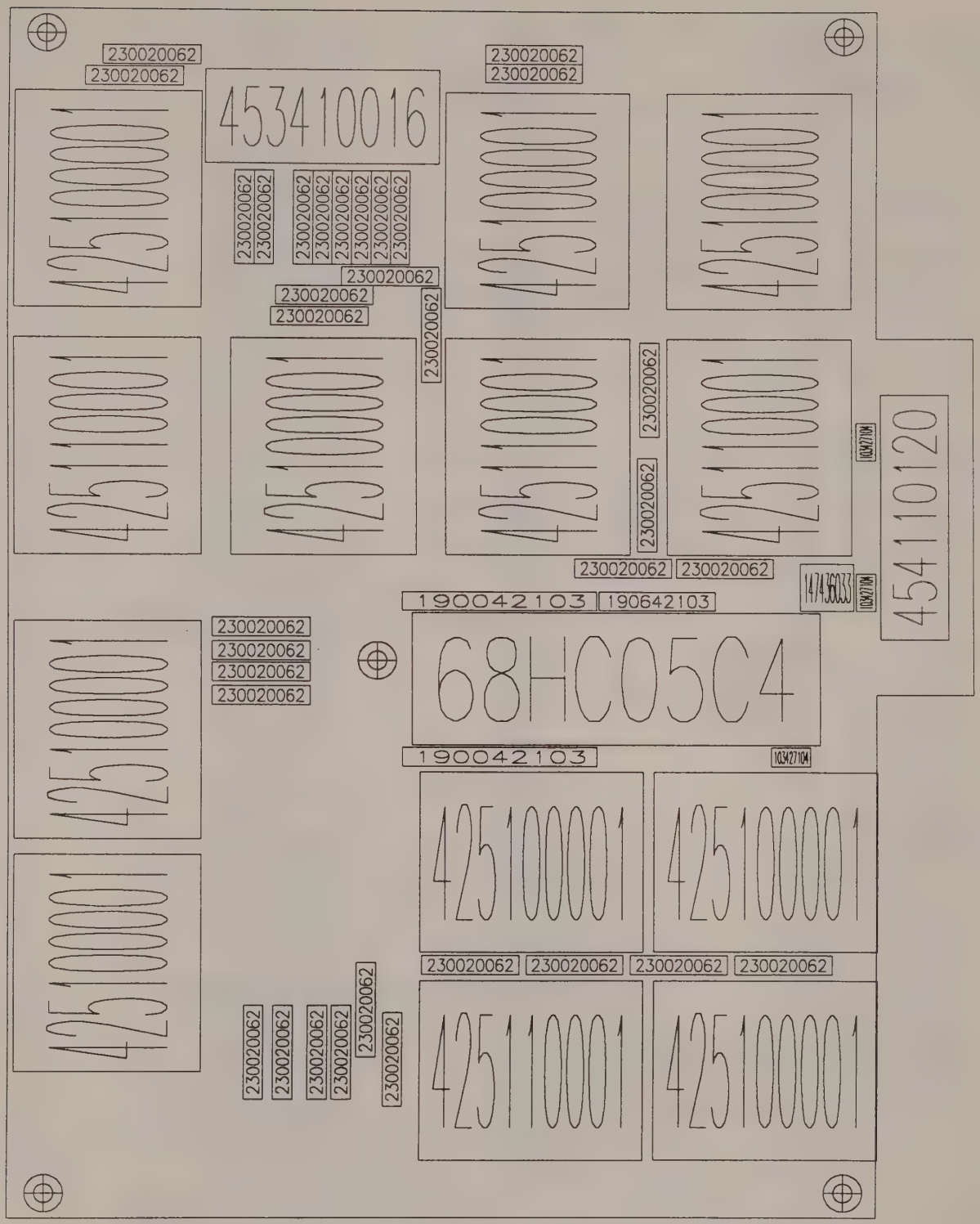
DRAWN KAOLUBSKI-B	MODEL : 9314-5 KEYPAD SCHEMATIC
CHKD MAURON-B	DWG NO: 9314-5-51
DATE 17-DEC-81	SH 1 OF 1 ECO : A



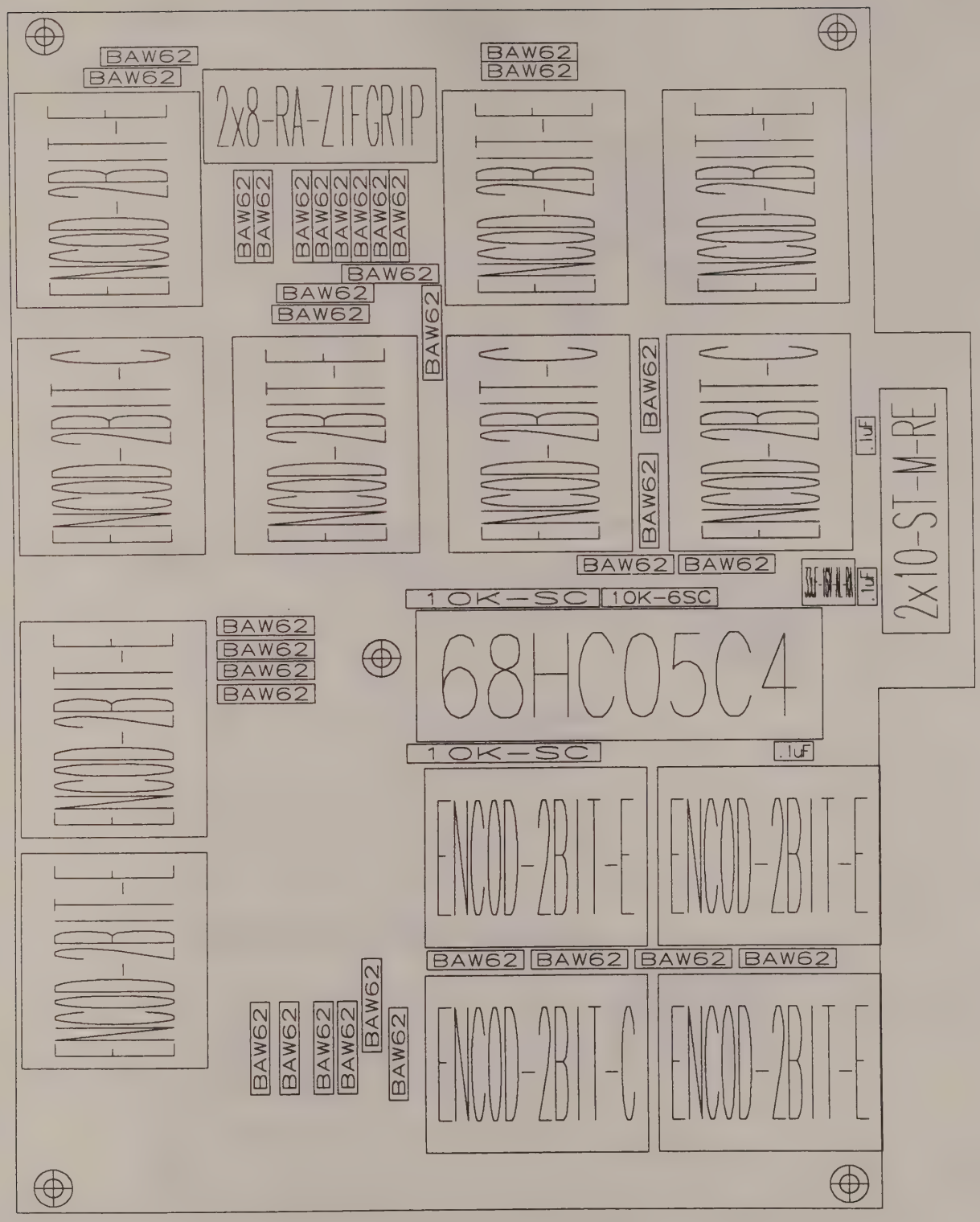
931x-5 REV:A


CR2
CR1
CR38
CR37
J76
J2
K32
N32
CR41
CR48
CR42
CR47
CR43
CR46
CR44
CR45
CR14
CR8
CR7
CR13
K76
J10
K10
N10
CR40
CR15
C1
J1
CR16
CR39
C4
C3
RN2
RN3
CR9
CR10
CR18
CR17
A 1
RN 1
C2
L76
M10
L10
CR31
CR32
CR23
CR24
M76
CR25
CR26
CR21
CR30
CR29
CR22
M32
L32

931x-5 REV:A


453410016
68HC05C4
454110120
425100001
425110001
230020062
190042103
190642103
103427104

931x-5 REV:A


2x8-RA-ZIFGRIP
68HC05C4
2x10-ST-M-RE
ENCOD-2BIT-E
ENCOD-2BIT-C
BAW62
10K-SC
10K-6SC
.1uF

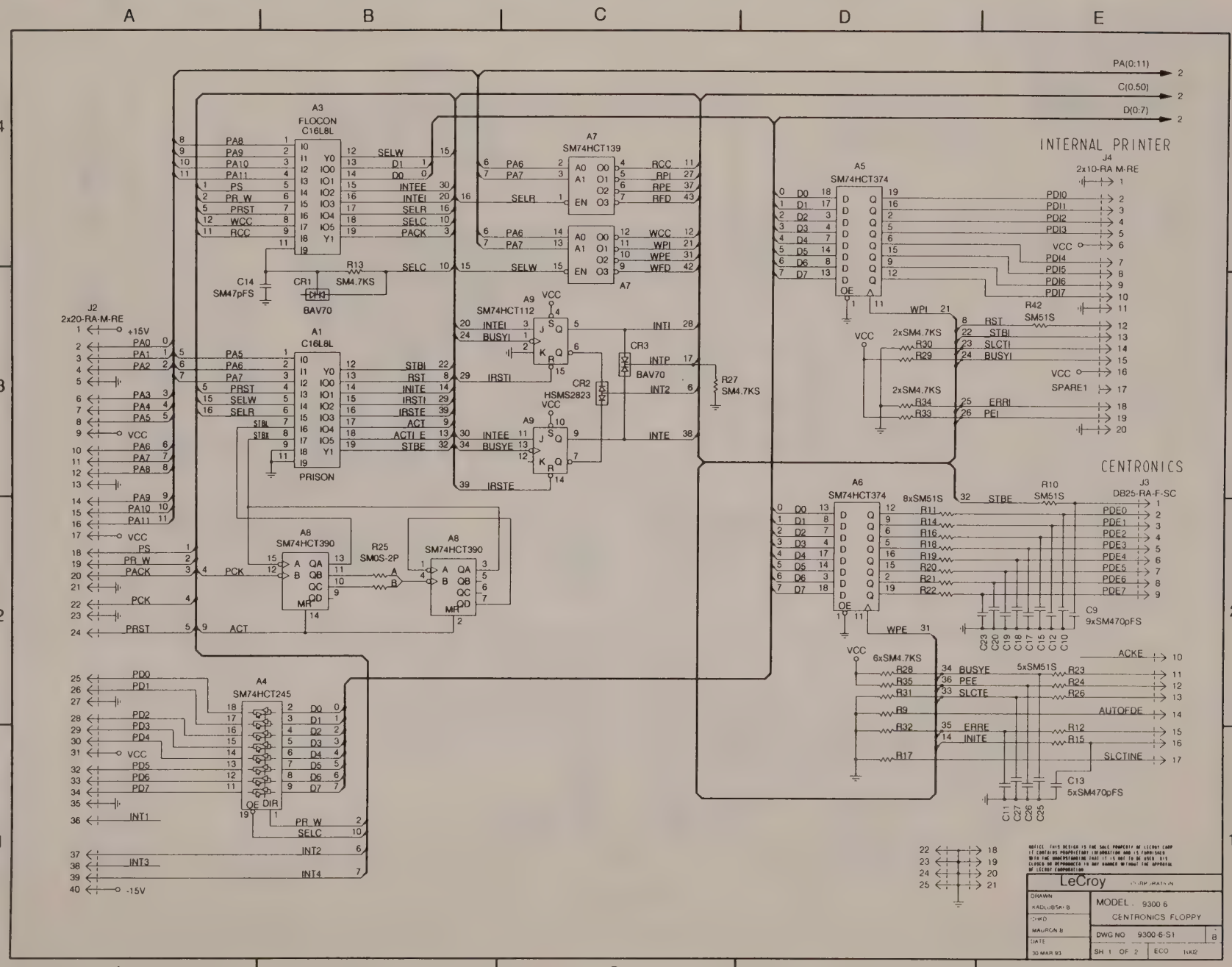
931x-5 REV:A

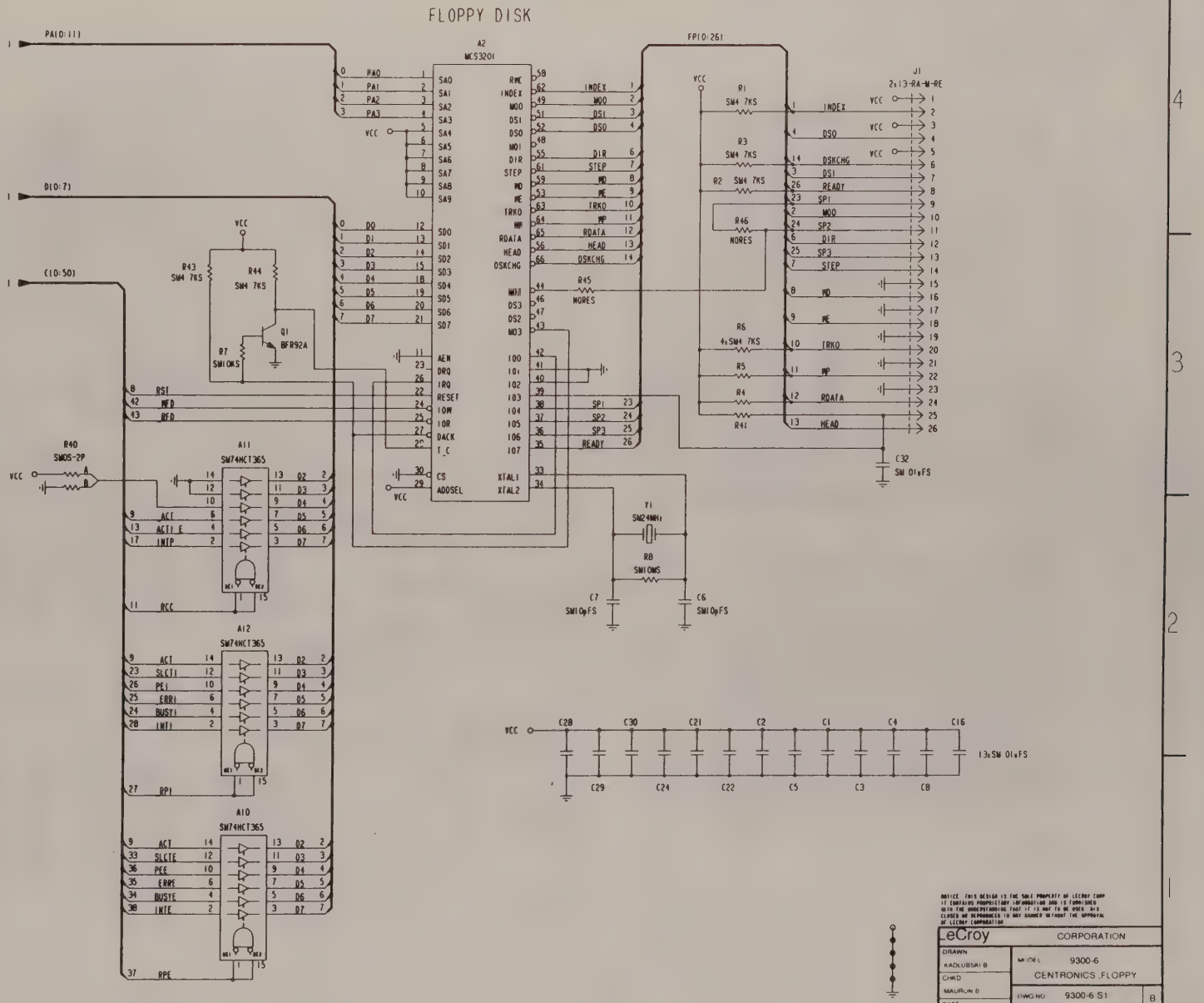
A1	227687058	68HC705C8 (HC05C4)	DIP40
C1	103427104	.1uF	SMONOBP
C2	103427104	.1uF	SMONOBP
C3	103427104	.1uF	SMONOBP
C4	147436033	33uF-16V-AL-RA	TCAP
CR1	230020062	BAW62	DO35
CR2	230020062	BAW62	DO35
CR7	230020062	BAW62	DO35
CR8	230020062	BAW62	DO35
CR9	230020062	BAW62	DO35
CR10	230020062	BAW62	DO35
CR13	230020062	BAW62	DO35
CR14	230020062	BAW62	DO35
CR15	230020062	BAW62	DO35
CR16	230020062	BAW62	DO35
CR17	230020062	BAW62	DO35
CR18	230020062	BAW62	DO35
CR21	230020062	BAW62	DO35
CR22	230020062	BAW62	DO35
CR23	230020062	BAW62	DO35
CR24	230020062	BAW62	DO35
CR25	230020062	BAW62	DO35
CR26	230020062	BAW62	DO35
CR29	230020062	BAW62	DO35
CR30	230020062	BAW62	DO35
CR31	230020062	BAW62	DO35
CR32	230020062	BAW62	DO35
CR37	230020062	BAW62	DO35
CR38	230020062	BAW62	DO35
CR39	230020062	BAW62	DO35
CR40	230020062	BAW62	DO35
CR41	230020062	BAW62	DO35
CR42	230020062	BAW62	DO35
CR43	230020062	BAW62	DO35
CR44	230020062	BAW62	DO35
CR45	230020062	BAW62	DO35
CR46	230020062	BAW62	DO35
CR47	230020062	BAW62	DO35
CR48	230020062	BAW62	DO35
J1	454110120	2x10-ST-M-RE	CONN2X10_ST_M_RE
J2	453410016	2x8-RA-ZIFGRIP	CONN2X8_RA_ZIFGRIP
J10	425100001	ENCOD-2BIT-E	ENCOD_2BIT_E
J76	425100001	ENCOD-2BIT-E	ENCOD_2BIT_E
K10	425110001	ENCOD-2BIT-C	ENCOD_2BIT_C
K32	425100001	ENCOD-2BIT-E	ENCOD_2BIT_E
K76	425110001	ENCOD-2BIT-C	ENCOD_2BIT_C
L10	425100001	ENCOD-2BIT-E	ENCOD_2BIT_E
L32	425100001	ENCOD-2BIT-E	ENCOD_2BIT_E
L76	425100001	ENCOD-2BIT-E	ENCOD_2BIT_E
M10	425100001	ENCOD-2BIT-E	ENCOD_2BIT_E
M32	425110001	ENCOD-2BIT-C	ENCOD_2BIT_C
M76	425100001	ENCOD-2BIT-E	ENCOD_2BIT_E
N10	425110001	ENCOD-2BIT-C	ENCOD_2BIT_C
N32	425100001	ENCOD-2BIT-E	ENCOD_2BIT_E
RN1	190042103	10K-SC	SIP10RES
RN2	190042103	10K-SC	SIP10RES
RN3	190642103	10K-6SC	SIP6RES

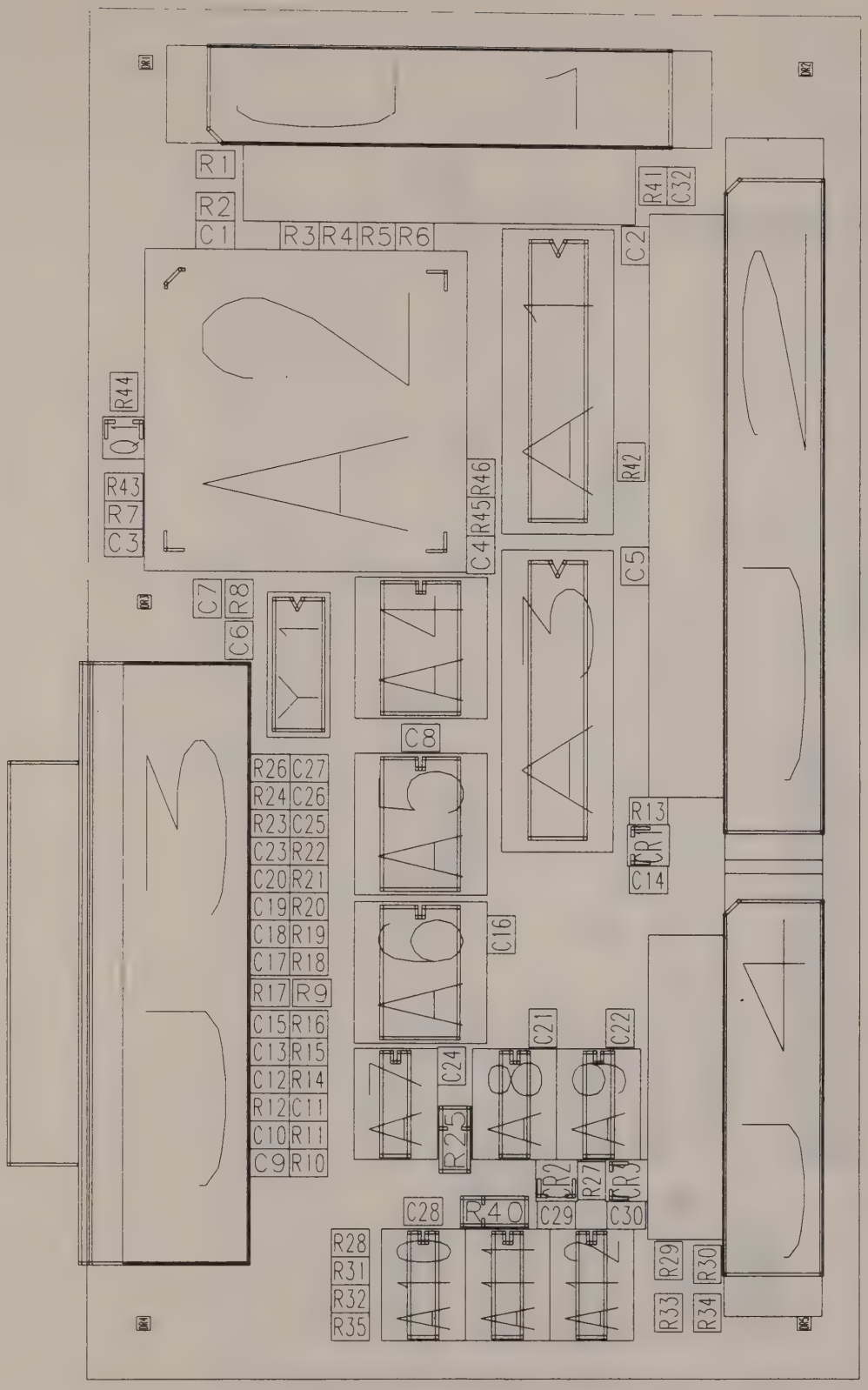
SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: F9310-5
DESC: DUAL CHANNEL FRONT PANEL 9300 UOM: EA SC: R REV: 5

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
103427104	CAP CERA MONO 100V .1 UF		1	P	EA	3.00	1.000	00/00/00	99/99/99	
147436033	CAP ALUM METAL CAN 33 UF		2	P	EA	1.00	1.000	00/00/00	99/99/99	
190042103	RESISTOR NETWORK 10 K		3	P	EA	2.00	1.000	00/00/00	99/99/99	
190642103	RESISTOR NETWORK 10 K		4	P	EA	1.00	1.000	00/00/00	99/99/99	
230020062	DIODE SWITCHING BAW62		5	P	EA	34.00	1.000	00/00/00	99/99/99	
425100001	ENCODER DIGITAL 24 POS		6	P	EA	9.00	1.000	00/00/00	99/99/99	
425110001	ENCODER DIGITAL 24 POS		7	P	EA	4.00	1.000	00/00/00	99/99/99	
453410016	CONN FLEX CIRCUIT 16-POS		11	P	EA	1.00	1.000	06/08/91	99/99/99	
454110120	HDR SLD TAIL/MALE/20/STRAIGHT		8	P	EA	1.00	1.000	00/00/00	99/99/99	
554435004	SCREW PT PHIL KA35X10		1001	P	EA	1.00	1.000	23/08/91	99/99/99	
7093XX511	KNOB 10MM DIAMETRE	A	1008	B	EA	8.00	1.000	24/01/92	99/99/99	
7093XX521	KNOB 14MM DIAMETRE	A	1009	B	EA	5.00	1.000	24/01/92	99/99/99	
719300503	PC BD PREASS'Y 9300-5	A	9	B	EA	1.00	1.000	00/00/00	99/99/99	
729310503	FP KEY BOARD ASS'Y 9310-5	B	1000	B	EA	1.00	1.000	23/08/91	99/99/99	
MFP414	IC FRT PANEL PROCESSOR MFP414		10	B	EA	1.00	1.000	14/02/92	99/99/99	


INTERNAL PRINTER
CENTRONICS
A3
FLOCON
C16L8L
A7
SM74HCT139
A5
SM74HCT374
J4
2x10-RA M-RE
A9
SM74HCT112
A1
C16L8L
PRISON
CR3
BAV70
CR2
HSMS2823
R27
SM4.7KS
A6
SM74HCT374
J3
DB25-RA-F-SC
J2
2x20-RA-M-RE
A8
SM74HCT390
A8
SM74HCT390
A4
SM74HCT245
C14
SM47pFS
CR1
BAV70
R13
SM4.7KS
C9
9xSM470pFS
C13
5xSM470pFS
6xSM4.7KS
5xSM51S
8xSM51S
2xSM4.7KS
PA(0:11)
C(0.50)
D(0:7)
LeCroy
MODEL 9300 6
CENTRONICS FLOPPY
DWG NO 9300-6-S1
SH 1 OF 2
30 MAR 93


FLOPPY DISK
PA(0:11)
DI(0:7)
CI(0:5O)
A2
WC53201
FP(0:26)
J1
2x13-RA-W-RE
R1
SM4 7KS
R3
SM4 7KS
R2 SM4 7KS
R46
NORES
R45
NORES
R6
4xSM4 7KS
R5
R4
R41
R43
SM4 7KS
R44
SM4 7KS
R7
SM10KS
Q1
BFR92A
R40
SMOS-2P
A11
SM74HCT365
A12
SM74HCT365
A10
SM74HCT365
Y1
SM24MHz
R8
SM10MS
C7
SM10pFS
C6
SM10pFS
C32
SM 01uFS
C28
C30
C21
C2
C1
C4
C16
C29
C24
C22
C5
C3
C8
13xSM 01uFS
INDEX
DSO
DSKCHG
DSI
READY
SP1
WDO
SP2
DIR
SP3
STEP
WD
WE
TRKO
WP
RDATA
HEAD
ACT
RCC
RPI
RPE
eCroy
CORPORATION
MODEL 9300-6
CENTRONICS FLOPPY
DWG NO 9300-6 S1
DRAWN KADLUBSKI B
CHKD MAURUN B
DATE 30-MAR-93


J1
R1
R2
C1
R3
R4
R5
R6
A2
R44
Q1
R43
R7
C3
C4
R45
R46
A1
C2
R41
C32
R42
J2
C5
C7
R8
C6
Y1
A4
A3
C8
J3
R26
C27
R24
C26
R23
C25
C23
R22
C20
R21
C19
R20
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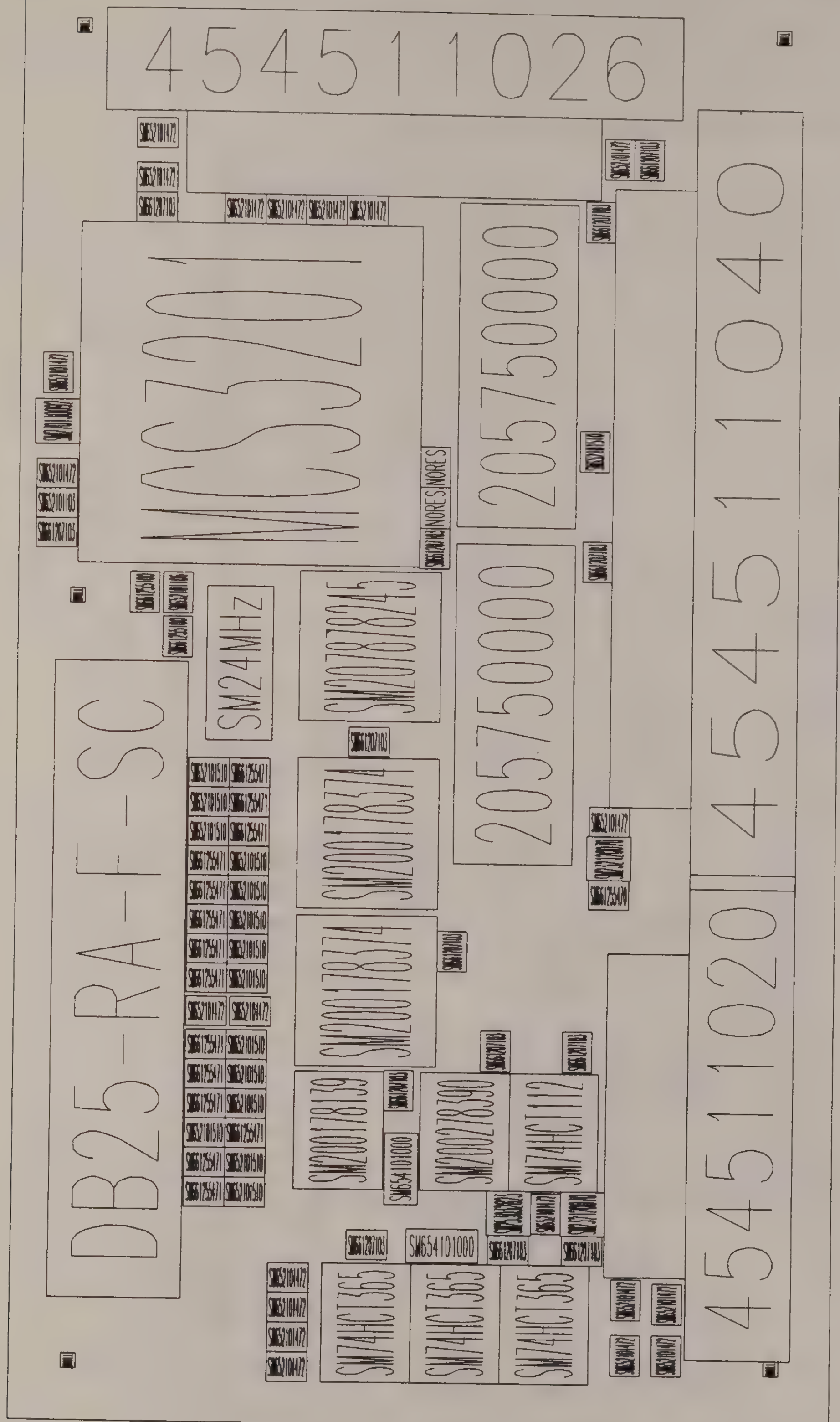
C17
R18
R17
R9
C15
R16
C13
R15
C12
R14
R12
C11
C10
R11
C9
R10
A5
A6
C16
R13
CR1
C14
C21
C22
A7
C24
R25
A8
A9
R26
R27
CR2
CR3
C28
R40
C29
C30
R28
R31
R32
R35
A10
A11
A12
R29
R30
R33
R34
J4

9300-6 REV:C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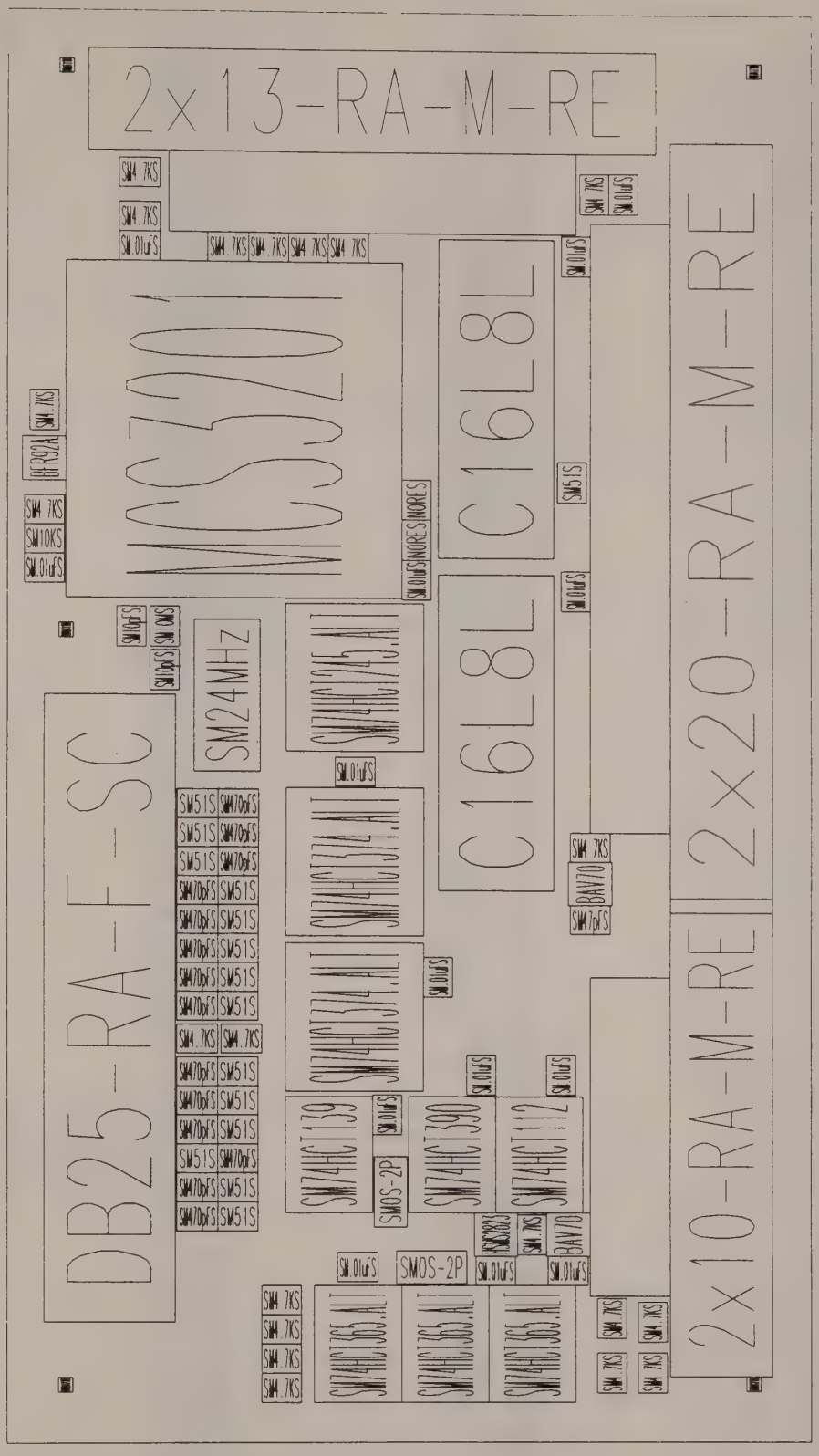
9300-6 REV:C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C16L8L
C16L8L
2x20-RA-M-RE
2x10-RA-M-RE
DB25-RA-F-SC
SM24MHz
SMOS-2P
SMOS-2P
BAV70
BAV70

9300-6 REV:C

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A2	SM227063201	MCS3201	PLCC_68
A3	205750000	C16L8L	DIP20
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A5	SM200178374	SM74HCT374	SOIC_20
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A7	SM200178139	SM74HCT139	SOIC_16
A8	SM200278390	SM74HCT390	SOIC_16
A9	SM201170112	SM74HCT112	SOIC_16
A10	SM207170036	SM74HCT365	SOIC_16
A11	SM207170036	SM74HCT365	SOIC_16
A12	SM207170036	SM74HCT365	SOIC_16
C1	SM661207103	SM.01uFS	SM0805
C2	SM661207103	SM.01uFS	SM0805
C3	SM661207103	SM.01uFS	SM0805
C4	SM661207103	SM.01uFS	SM0805
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C32	SM661207103	SM.01uFS	SM0805
CR1	SM232120070	BAV70	SOT23
CR2	SM253032823	HSMS2823	SOT23
CR3	SM232120070	BAV70	SOT23
J1	454511026	2x13-RA-M-RE	CONN2X13_RA_M_RE
J2	454511040	2x20-RA-M-RE	CONN2X20_RA_M_RE
J3	454520025	DB25-RA-F-SC	DB25_RA_F_SC
J4	454511020	2x10-RA-M-RE	CONN2X10_RA_M_RE
Q1	SM270130092	BFR92A	SOT23
R1	SM652101472	SM4.7KS	SM0805
R2	SM652101472	SM4.7KS	SM0805
R3	SM652101472	SM4.7KS	SM0805
R4	SM652101472	SM4.7KS	SM0805
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R7	SM652101103	SM10KS	SM0805
R8	SM652101106	SM10MS	SM0805
R9	SM652101472	SM4.7KS	SM0805
R10	SM652101510	SM51S	SM0805
R11	SM652101510	SM51S	SM0805
R12	SM652101510	SM51S	SM0805
R13	SM652101472	SM4.7KS	SM0805

R14	SM652101510	SM51S	SM0805
R15	SM652101510	SM51S	SM0805
R16	SM652101510	SM51S	SM0805
R17	SM652101472	SM4.7KS	SM0805
R18	SM652101510	SM51S	SM0805
R19	SM652101510	SM51S	SM0805
R20	SM652101510	SM51S	SM0805
R21	SM652101510	SM51S	SM0805
R22	SM652101510	SM51S	SM0805
R23	SM652101510	SM51S	SM0805
R24	SM652101510	SM51S	SM0805
R25	SM654101000	SM0S-2P	SM0805_2P
R26	SM652101510	SM51S	SM0805
R27	SM652101472	SM4.7KS	SM0805
R28	SM652101472	SM4.7KS	SM0805
R29	SM652101472	SM4.7KS	SM0805
R30	SM652101472	SM4.7KS	SM0805
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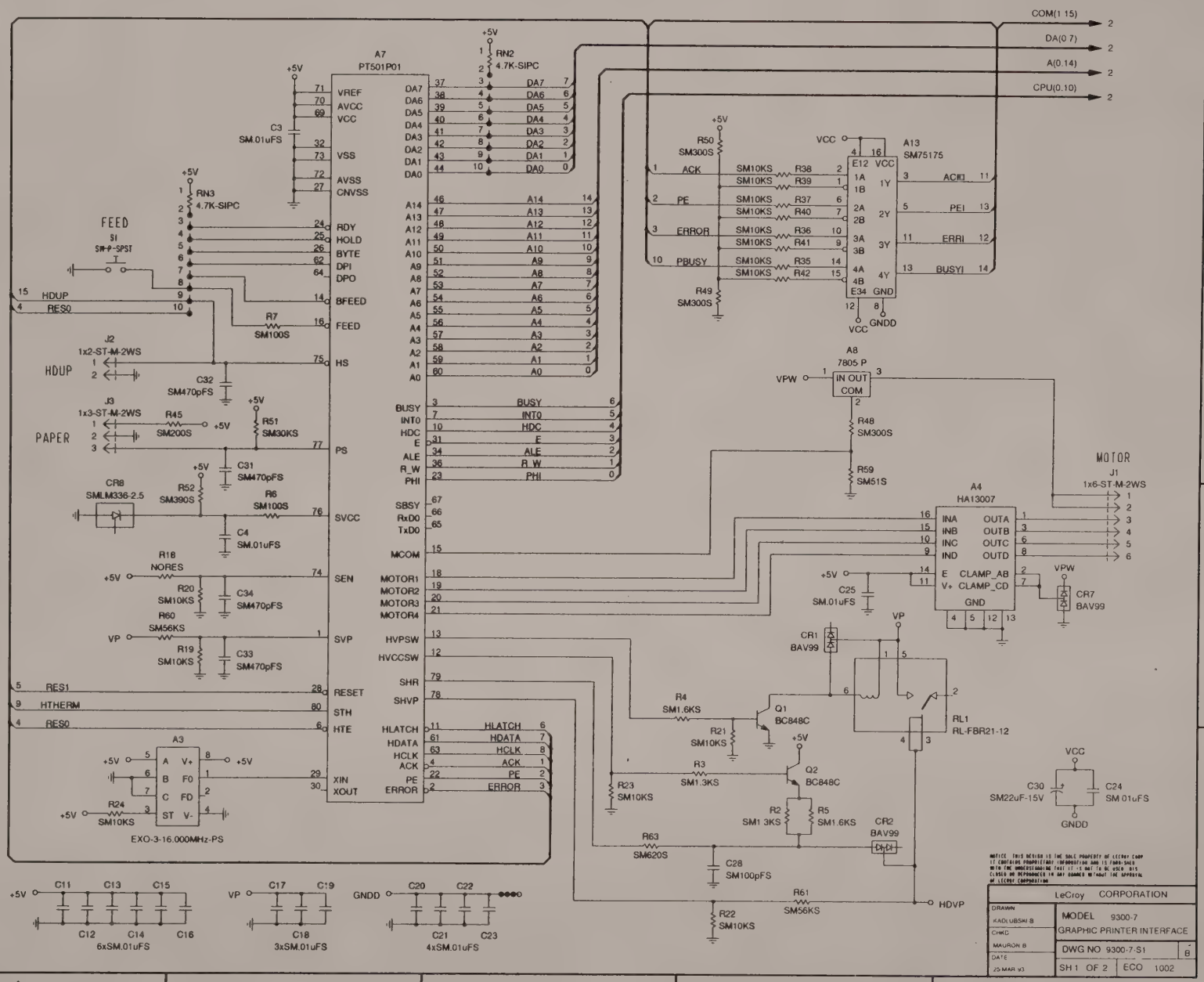
R33	SM652101472	SM4.7KS	SM0805
R34	SM652101472	SM4.7KS	SM0805
R35	SM652101472	SM4.7KS	SM0805
R40	SM654101000	SM0S-2P	SM0805_2P
R41	SM652101472	SM4.7KS	SM0805
R42	SM652101510	SM51S	SM0805
R43	SM652101472	SM4.7KS	SM0805
R44	SM652101472	SM4.7KS	SM0805
Y1	SM310900024	SM24MHz	FPX_SM

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: F9300-6
DESC: CENTRONICS/FLOPPY/PRINTER INT. UOM: EA SC: R REV: A

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
205750000	IC AND-OR GATE ARRAY 16V8		1	P	EA	2.00	1.000	00/00/00	99/99/99	
454511020	HDR SOLD TAIL/MALE 20		2	P	EA	1.00	1.000	00/00/00	99/99/99	
454511026	HDR SOLD TAIL/MALE 26		3	P	EA	1.00	1.000	00/00/00	99/99/99	
454511040	HDR SOLD TAIL/MALE/40/RT		4	P	EA	1.00	1.000	00/00/00	99/99/99	
454520025	CONN RT ANGLE FEM 25 S-CLIP		5	P	EA	1.00	1.000	00/00/00	99/99/99	
455980002	MOUNTING HDW FOR CONN SHELL		1000	P	EA	2.00	1.000	00/00/00	99/99/99	
550430106	SCREW CYL HD PHIL M3X6		1001	P	EA	4.00	1.000	00/00/00	99/99/99	
551430400	WASHER SHAKEPROOF M3		1002	P	EA	4.00	1.000	00/00/00	99/99/99	
709300611	CENTR. FLOPPY INTERF. BRACKET	B	1003	B	EA	1.00	1.000	00/00/00	99/99/99	
709300621	LABEL PARA-INTERF. CENTRONICS	A	1004	B	EA	1.00	1.000	00/00/00	99/99/99	
719300603	PC BD PREASS'Y 9300-6	B	6	B	EA	1.00	1.000	00/00/00	99/99/99	
SM200178139	IC 2-TO-4-LINE DEC HCT139		7	P	EA	1.00	1.000	00/00/00	99/99/99	
SM200178374	IC D-TYP FLOP 74HCT374		8	P	EA	2.00	1.000	00/00/00	99/99/99	
SM200278390	IC 4-BIT RIPPLE COUNTER		9	P	EA	1.00	1.000	00/00/00	99/99/99	
SM201170112	IC DUAL JK FF WITH SET-RESET		10	P	EA	1.00	1.000	00/00/00	99/99/99	
SM207170036	IC HEX BUFFER 3-STATE		11	P	EA	3.00	1.000	00/00/00	99/99/99	
SM207878245	IC BUS TRANSCVR HCT 245		12	P	EA	1.00	1.000	00/00/00	99/99/99	
SM227063201	IC IBM PC FLOPPY DISK CONTR.		13	P	EA	1.00	1.000	00/00/00	99/99/99	
SM232120070	DIODE ARRAY BAV70		14	P	EA	2.00	1.000	00/00/00	99/99/99	
SM253032823	DIODE SCHOTTKY 2823		15	P	EA	1.00	1.000	00/00/00	99/99/99	
SM270130092	TRANSISTOR NPN BFR92A		16	P	EA	1.00	1.000	12/01/93	99/99/99	
SM310900024	CRYSTAL 24 MHZ SMD		17	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101103	RES CHIP (E24) 1% 10 K		18	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101106	RES CHIP (E24) 1% 10 MEG		19	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101472	RES CHIP (E24) 1% 4.7 K		20	P	EA	21.00	1.000	00/00/00	99/99/99	
SM652101510	RES CHIP (E24) 1% 51 OHMS		21	P	EA	15.00	1.000	00/00/00	99/99/99	
SM654101000	CHIP JUMPER ZERO OHMS		22	P	EA	2.00	1.000	00/00/00	99/99/99	
SM661207103	CAP CERA CHIP 20% .01UF		23	P	EA	14.00	1.000	00/00/00	99/99/99	
SM661255100	CAP CERA CHIP 10PF		24	P	EA	2.00	1.000	00/00/00	99/99/99	
SM661255470	CAP CERA CHIP 47PF		25	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661255471	CAP CERA CHIP 5% 470 PF		26	P	EA	14.00	1.000	00/00/00	99/99/99	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AVSS
CNVSS
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DPI
DPO
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FEED
HS
PS
SVCC
SEN
SVP
RESET
STH
HTE
XIN
XOUT
SBSY
RxD0
TxD0
MCOM
MOTOR1
MOTOR2
MOTOR3
MOTOR4
HVPSW
HVCCSW
SHR
SHVP
HLATCH
HDATA
HCLK
ACK
PE
ERROR
DA7
DA6
DA5
DA4
DA3
DA2
DA1
DA0
A14
A13
A12
A11
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
A0
BUSY
INT0
HDC
E
ALE
R_W
PHI
RN2
4.7K-SIPC
RN3
4.7K-SIPC
C3
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C25
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C28
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C30
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C24
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R6
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R7
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R45
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CR7
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Q1
BC848C
Q2
BC848C
RL1
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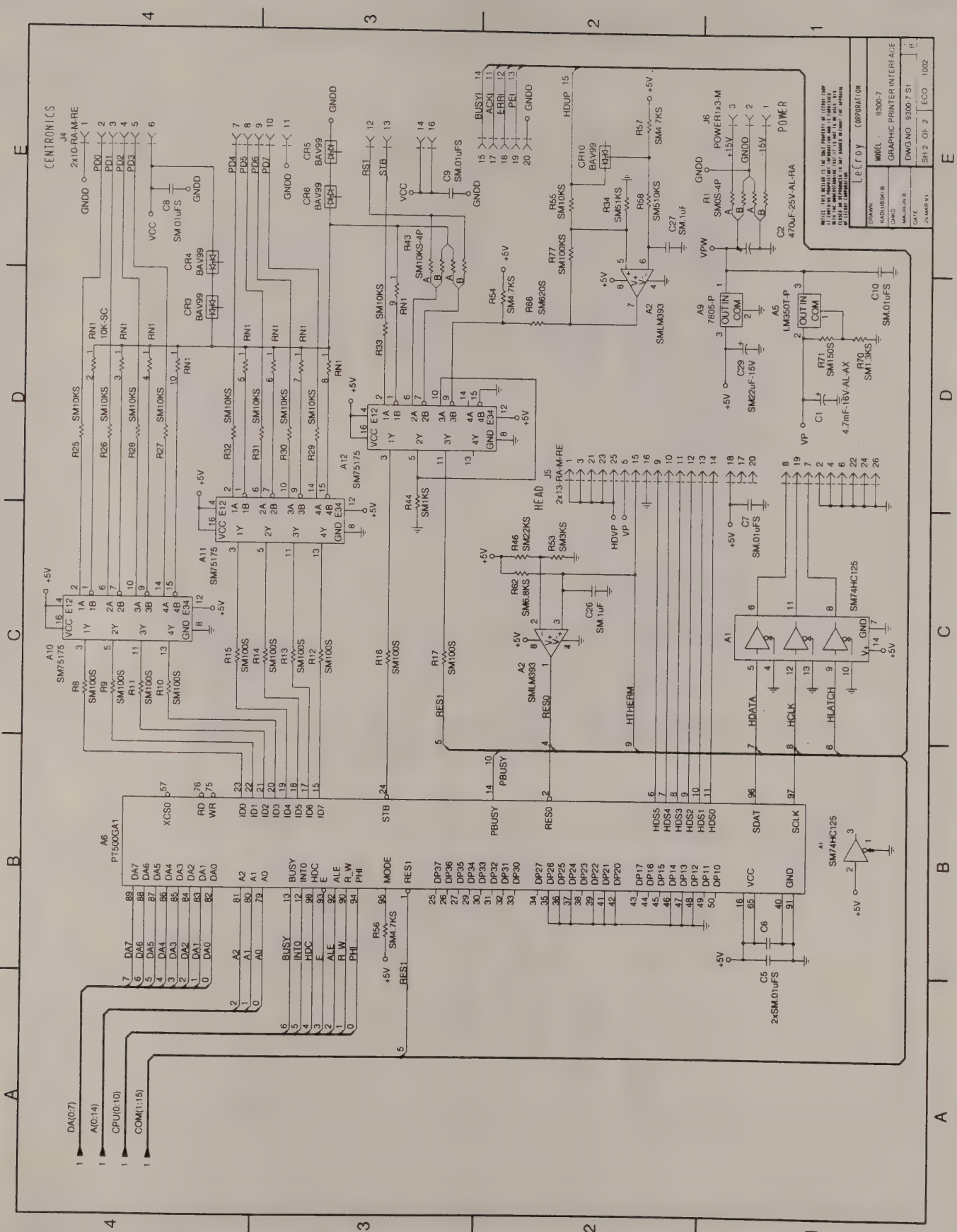
A3
EXO-3-16.000MHz-PS
A4
HA13007
A8
7805 P
A13
SM75175
J1
1x6-ST-M-2WS
J2
1x2-ST-M-2WS
J3
1x3-ST-M-2WS
FEED
SW-P-SPST
HDUP
PAPER
MOTOR
COM(1 15)
DA(0 7)
A(0.14)
CPU(0.10)
ACK
PE
ERROR
PBUSY
VPW
HDVP
+5V
VP
VCC
GNDD
6xSM.01uFS
3xSM.01uFS
4xSM.01uFS
LeCroy CORPORATION
MODEL 9300-7
GRAPHIC PRINTER INTERFACE
DWG NO 9300-7-S1
SH 1 OF 2
ECO 1002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POWER
HEAD
LeCroy CORPORATION
GRAPHIC PRINTER INTERFACE
DWG NO 9300-7 S1
SH 2 OF 2
ECO 1002
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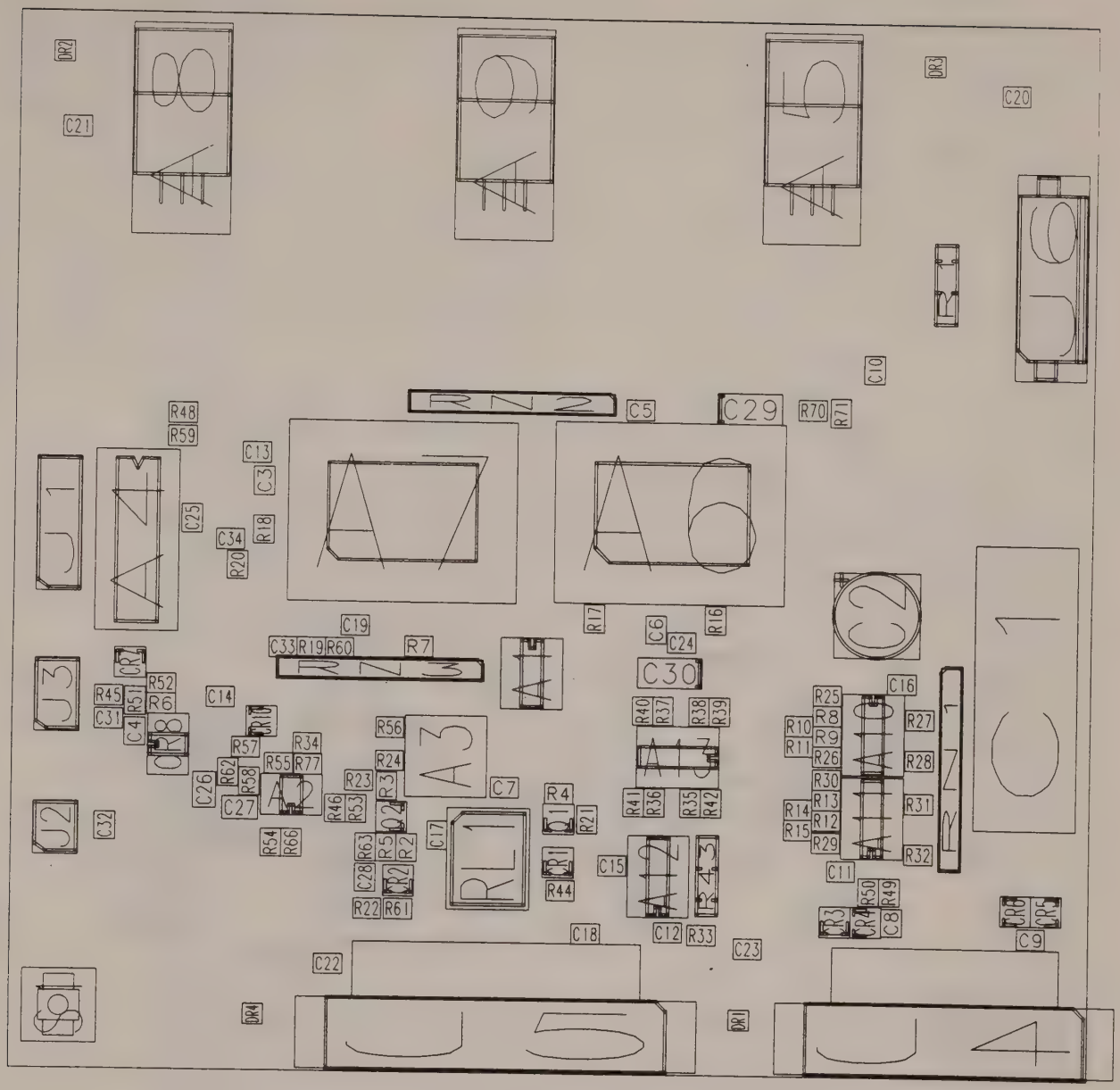
9300-7 Rev:C



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DR3
C20
C10
R48
R59
C13
C3
C25
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R18
R20
C5
C29
R70
R71
J1
J3
J2
C19
C33
R19
R60
R7
R17
C6
C24
R16
C30
C14
R45
R51
R52
R6
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R38
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R5
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C28
R22
R61
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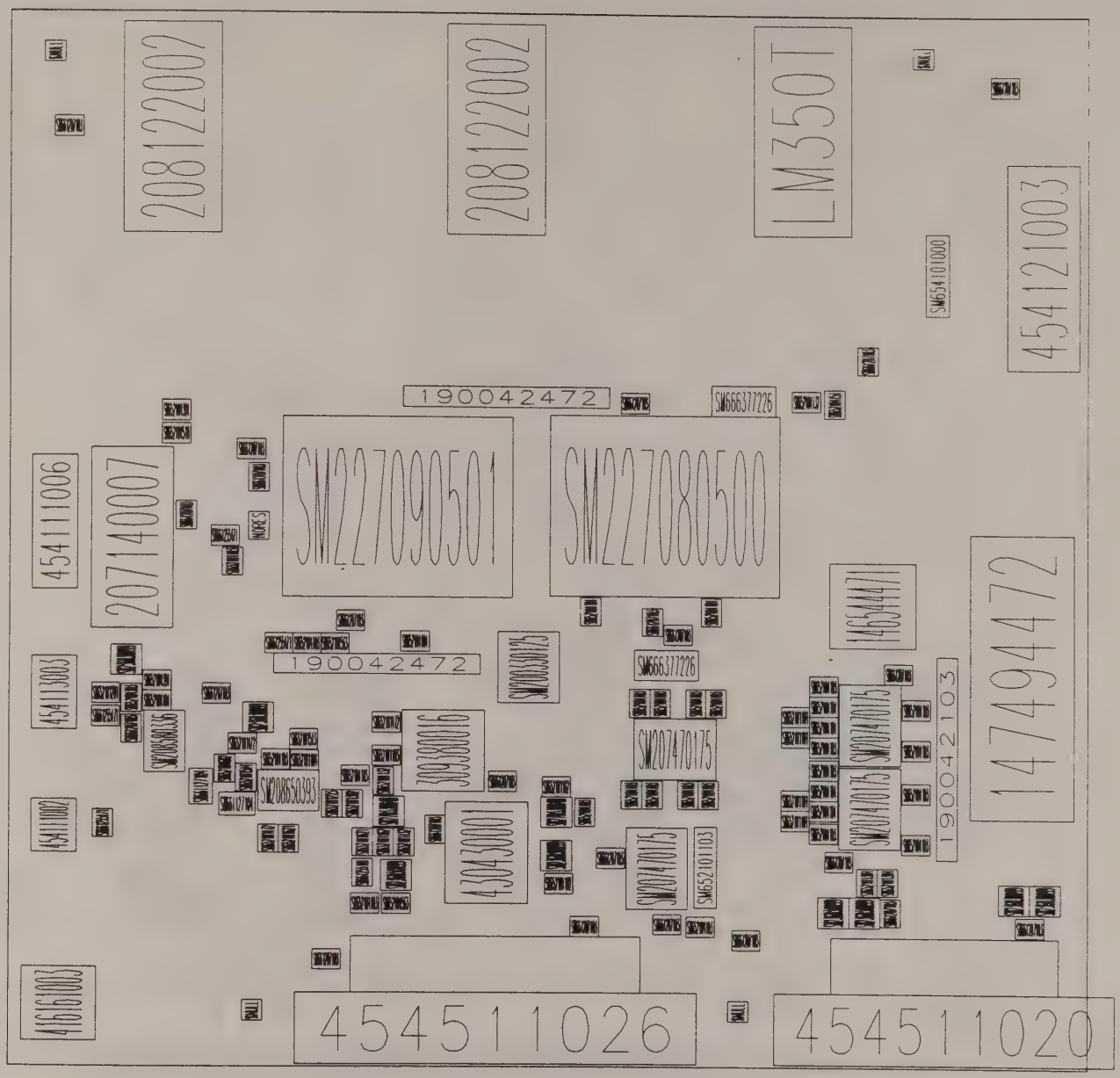
C22
DR4
DR1
J5
J4

9300-7 Rev:C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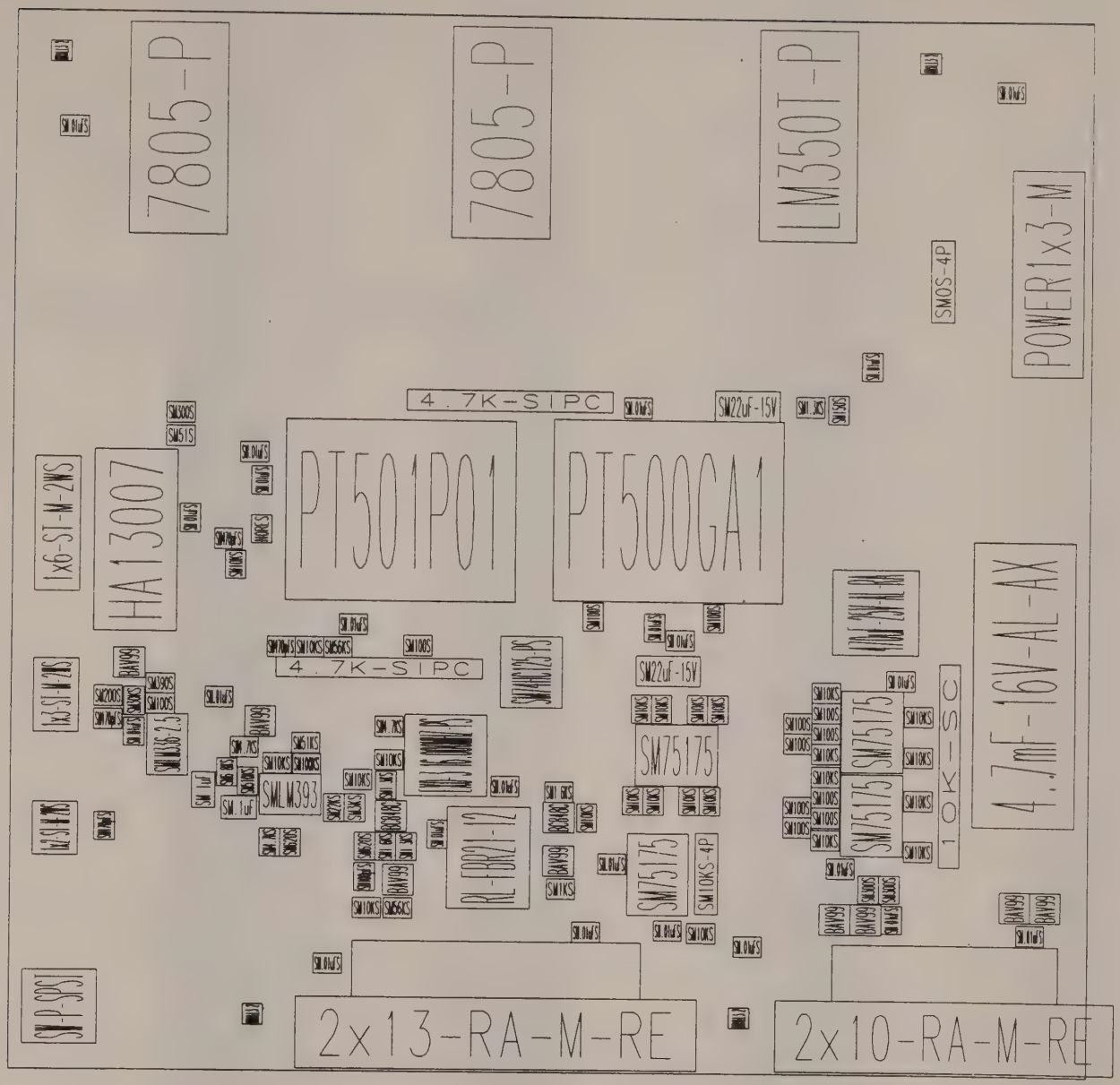
9300-7 Rev:C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PT500GA1
HA13007
1x6-ST-M-2WS
4.7K-SIPC
SM22uF-15V
SM75175
SM75175
SM75175
SM75175
SMLM393
RL-FBR21-12
SM10KS-4P
10K-SC
4.7mF-16V-AL-AX
2x13-RA-M-RE
2x10-RA-M-RE

A1	SM200330125	SM74HC125-PS	SOIC_14
A2	SM208650393	SMLM393	SOIC_8
A3	309380016	EXO-3-16.000MHZ-PS	DIP8
A4	207140007	HA13007	DIP16
A5	208590350	LM350T-P	TO220_PLATED
A6	SM227080500	PT500GA1	PQFP_100
A7	SM227090501	PT501P01	PQFP_80
A8	208122002	7805-P	TO220_PLATED
A9	208122002	7805-P	TO220_PLATED
A10	SM207470175	SM75175	SOIC_16
A11	SM207470175	SM75175	SOIC_16
A12	SM207470175	SM75175	SOIC_16
A13	SM207470175	SM75175	SOIC_16
C1	147494472	4.7mF-16V-AL-AX	A_P1377_L1200X610
C2	146544471	470uF-25V-AL-RA	R_P200_D420POL
C3	SM661207103	SM.01uFS	SM0805
C4	SM661207103	SM.01uFS	SM0805
C5	SM661207103	SM.01uFS	SM0805
C6	SM661207103	SM.01uFS	SM0805
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C27	SM661127104	SM.1uF	SM1206
C28	SM661255101	SM100pFS	SM0805
C29	SM666377226	SM22uF-15V	SMCAPETD5
C30	SM666377226	SM22uF-15V	SMCAPETD5
C31	SM661255471	SM470pFS	SM0805
C32	SM661255471	SM470pFS	SM0805
C33	SM661255471	SM470pFS	SM0805
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CR6	SM236030099	BAV99	SOT23
CR7	SM236030099	BAV99	SOT23
CR8	SM208580336	SMLM336-2.5	SOIC_8
CR10	SM236030099	BAV99	SOT23
J1	454111006	1x6-ST-M-2WS	CONN1X6_ST_M_2WS
J2	454111002	1x2-ST-M-2WS	CONN1X2_ST_M_2WS
J3	454113003	1x3-ST-M-2WS	CONN1X3_ST_M_2WS
J4	454511020	2x10-RA-M-RE	CONN2X10_RA_M_RE
J5	454511026	2x13-RA-M-RE	CONN2X13_RA_M_RE
J6	454121003	POWER1x3-M	POWER1X3_M
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Q2	SM270330848	BC848C	SOT23

R1	SM654101000	SM0S-4P	SM0805_4P
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R3	SM652101132	SM1.3KS	SM0805
R4	SM652101162	SM1.6KS	SM0805
R5	SM652101162	SM1.6KS	SM0805
R6	SM652101101	SM100S	SM0805
R7	SM652101101	SM100S	SM0805
R8	SM652101101	SM100S	SM0805
R9	SM652101101	SM100S	SM0805
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R21	SM652101103	SM10KS	SM0805
R22	SM652101103	SM10KS	SM0805
R23	SM652101103	SM10KS	SM0805
R24	SM652101103	SM10KS	SM0805
R25	SM652101103	SM10KS	SM0805
R26	SM652101103	SM10KS	SM0805
R27	SM652101103	SM10KS	SM0805
R28	SM652101103	SM10KS	SM0805
R29	SM652101103	SM10KS	SM0805
R30	SM652101103	SM10KS	SM0805
R31	SM652101103	SM10KS	SM0805
R32	SM652101103	SM10KS	SM0805
R33	SM652101103	SM10KS	SM0805
R34	SM652101513	SM51KS	SM0805
R35	SM652101103	SM10KS	SM0805
R36	SM652101103	SM10KS	SM0805
R37	SM652101103	SM10KS	SM0805
R38	SM652101103	SM10KS	SM0805
R39	SM652101103	SM10KS	SM0805
R40	SM652101103	SM10KS	SM0805
R41	SM652101103	SM10KS	SM0805
R42	SM652101103	SM10KS	SM0805
R43	SM652101103	SM10KS-4P	SM0805_4P
R44	SM652101102	SM1KS	SM0805
R45	SM652101201	SM200S	SM0805
R46	SM652101223	SM22KS	SM0805
R48	SM652101301	SM300S	SM0805
R49	SM652101301	SM300S	SM0805
R50	SM652101301	SM300S	SM0805
R51	SM652101303	SM30KS	SM0805
R52	SM652101391	SM390S	SM0805
R53	SM652101302	SM3KS	SM0805
R54	SM652101472	SM4.7KS	SM0805
R55	SM652101103	SM10KS	SM0805
R56	SM652101472	SM4.7KS	SM0805
R57	SM652101472	SM4.7KS	SM0805
R58	SM652101514	SM510KS	SM0805
R59	SM652101510	SM51S	SM0805
R60	SM652101563	SM56KS	SM0805
R61	SM652101563	SM56KS	SM0805
R62	SM652101682	SM6.8KS	SM0805
R63	SM652101621	SM620S	SM0805
R66	SM652101621	SM620S	SM0805
R70	SM652101132	SM1.3KS	SM0805
R71	SM652101151	SM150S	SM0805

R77	SM652101104	SM100KS	SM0805
RL1	430430001	RL-FBR21-12	RL_FBR20
RN1	190042103	10K-SC	SIP10RES
RN2	190042472	4.7K-SIPC	SIP10RES
RN3	190042472	4.7K-SIPC	SIP10RES
S1	416161003	SW-P-SPST	SW P SPST

SUBASSEMBLIES
PART: F9300-7
DESC: LTP 5446 PRINTER CONTROLLER UOM: EA SC: R REV: 2

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
146544471	CAP MINI ALUM 20% 470UF		1	P	EA	1.00	1.000	00/00/00	99/99/99	
147494472	CAP ALU COMPACT AXIAL 4700 UF		2	P	EA	1.00	1.000	00/00/00	99/99/99	
190042103	RESISTOR NETWORK 10 K		3	P	EA	1.00	1.000	00/00/00	99/99/99	
190042472	RESISTOR NETWORK 4.7 K		4	P	EA	2.00	1.000	00/00/00	99/99/99	
207140007	IC QUAD STEP MOTOR DRIVER		5	P	EA	1.00	1.000	00/00/00	99/99/99	
208122002	IC VOLT REG POS UA7805		6	P	EA	2.00	1.000	00/00/00	99/99/99	
208590350	IC ADJ POWER REG 3A LM350		7	P	EA	1.00	1.000	25/11/92	99/99/99	
309380016	CRYSTAL OSC (PROGR) 16 MHZ		8	P	EA	1.00	1.000	00/00/00	99/99/99	
416161003	SWITCH PUSHBUTTON SPST		9	P	EA	1.00	1.000	25/11/92	99/99/99	
430430002	RELAY 1 FORM C SPDT		10	P	EA	1.00	1.000	23/10/92	99/99/99	
454111002	HEADER STRAIGHT 2-PINS		11	P	EA	1.00	1.000	00/00/00	99/99/99	
454111006	HEADER STRAIGHT 6-PINS		12	P	EA	1.00	1.000	00/00/00	99/99/99	
454113003	HEADER STRAIGHT 3-PINS		13	P	EA	1.00	1.000	00/00/00	99/99/99	
454121003	BLOC FOR SOCKETS 3-PIN		14	P	EA	1.00	1.000	00/00/00	99/99/99	
454511020	HDR SOLD TAIL/MALE 20		15	P	EA	1.00	1.000	00/00/00	99/99/99	
454511026	HDR SOLD TAIL/MALE 26		16	P	EA	1.00	1.000	00/00/00	99/99/99	
554435401	RIVET "RIVSCREW" M 3.5		17	P	EA	3.00	1.000	00/00/00	99/99/99	
719300703	PC BD PREASS'Y 9300-7	B	18	B	EA	1.00	1.000	00/00/00	99/99/99	
SM200330125	IC QUAD BUFFER 74HC125		20	P	EA	1.00	1.000	00/00/00	99/99/99	
SM207470175	IC QUAD DIFF LINE RECEIVER		21	P	EA	4.00	1.000	00/00/00	99/99/99	
SM208580336	IC REF DIODE LM336-2.5V		22	P	EA	1.00	1.000	00/00/00	99/99/99	
SM208650393	IC DUAL VOLT COMP LM393M		23	P	EA	1.00	1.000	00/00/00	99/99/99	
SM227080500	IC THERM PRINTER GATE ARRAY		24	P	EA	1.00	1.000	00/00/00	99/99/99	
SM227090501	IC THERM PRINTER CPU		25	P	EA	1.00	1.000	00/00/00	99/99/99	
SM236030099	DIODE SO-PKG BAV99		26	P	EA	8.00	1.000	25/11/92	99/99/99	
SM270330848	TRANSISTOR NPN BC848C		27	P	EA	2.00	1.000	25/11/92	99/99/99	
SM652101101	RES CHIP (E24) 1% 100 OHM		28	P	EA	12.00	1.000	00/00/00	99/99/99	
SM652101102	RES CHIP (E24) 1% 1 K		29	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101103	RES CHIP (E24) 1% 10 K		30	P	EA	25.00	1.000	00/00/00	99/99/99	
SM652101104	RES CHIP (E24) 1% 100 K		51	P	EA	1.00	1.000	25/11/92	99/99/99	
SM652101132	RES CHIP (E24) 1% 1.3 K		31	P	EA	3.00	1.000	25/11/92	99/99/99	
SM652101151	RES CHIP (E24) 1% 150 OHM		52	P	EA	1.00	1.000	25/11/92	99/99/99	
SM652101162	RES CHIP (E24) 1% 1.6 K		32	P	EA	2.00	1.000	00/00/00	99/99/99	
SM652101201	RES CHIP (E24) 1% 200 OHM		33	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101223	RES CHIP (E24) 1% 22 K		34	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101301	RES CHIP (E24) 1% 300 OHM		35	P	EA	3.00	1.000	25/11/92	99/99/99	
SM652101302	RES CHIP (E24) 1% 3 K		36	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101303	RES CHIP (E24) 1% 30 K		37	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101391	RES CHIP (E24) 1% 390 OHM		38	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101472	RES CHIP (E24) 1% 4.7 K		39	P	EA	3.00	1.000	00/00/00	99/99/99	
SM652101510	RES CHIP (E24) 1% 51 OHMS		40	P	EA	1.00	1.000	00/00/00	99/99/99	
SM652101513	RES CHIP (E24) 1% 51 K		53	P	EA	1.00	1.000	25/11/92	99/99/99	
SM652101514	RES CHIP (E24) 1% 510 K		41	P	EA	1.00	1.000	25/11/92	99/99/99	
SM652101563	RES CHIP (E24) 1% 56 K		42	P	EA	2.00	1.000	00/00/00	99/99/99	
SM652101621	RES CHIP (E24) 1% 620 OHM		43	P	EA	2.00	1.000	25/11/92	99/99/99	
SM652101682	RES CHIP (E24) 1% 6.8 K		44	P	EA	1.00	1.000	00/00/00	99/99/99	
SM654101000	CHIP JUMPER ZERO OHMS		45	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661127104	CAP CERA CHIP 20% .1 UF		46	P	EA	2.00	1.000	00/00/00	99/99/99	
SM661207103	CAP CERA CHIP 20% .01UF		47	P	EA	23.00	1.000	00/00/00	99/99/99	
SM661255101	CAP CERA CHIP 5% 100 PF		48	P	EA	1.00	1.000	00/00/00	99/99/99	
SM661255471	CAP CERA CHIP 5% 470 PF		49	P	EA	4.00	1.000	00/00/00	99/99/99	
SM666377226	CAP MOLD TANT CHIP 22 UF		50	P	EA	2.00	1.000	00/00/00	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

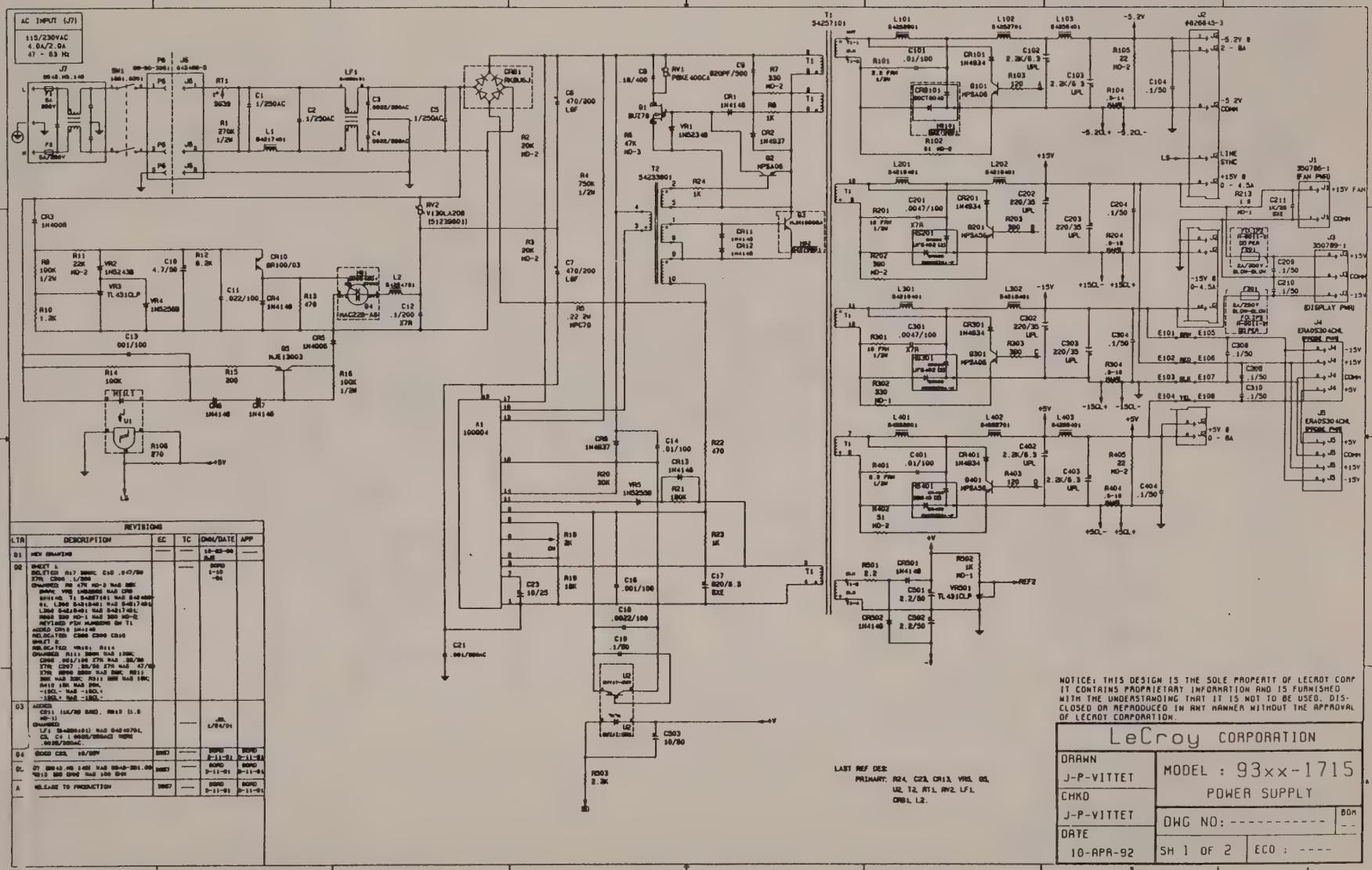
CLASS CODE: 2
SUBASSEMBLIES
PART: M93XX
DESC: MECHANICAL FOR 93XX-SERIES UOM: EA SC: R REV: 13

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
377051005	LABEL "DANGER————ONLY"	A	54	P	EA	1.00	1.000	15/10/91	99/99/99	
377131001	LABEL (GROUND SYMBOL)		55	P	EA	1.00	1.000	15/10/91	99/99/99	
407036002	FUSE HOLDER 2 POLE BLK 6.3X32		52	P	EA	1.00	1.000	13/09/91	99/99/99	
433162500	FUSE 250V/5A		14	P	EA	2.00	1.000	09/06/92	99/99/99	
434690002	LINE INPUT MODULE 250V/6A		51	P	EA	1.00	1.000	13/09/91	99/99/99	
485023462	FOOT BUMPON GREY		0	P	EA	4.00	1.000	09/06/92	99/99/99	
530301009	BLK HANDLE W/2 BLACK END CAPS		8	P	EA	1.00	1.000	00/00/00	99/99/99	
530904000	FAN GRID FOR SERIE 4000		53	P	EA	1.00	1.000	13/09/91	99/99/99	
550430106	SCREW CYL HD PHIL M3X6		37	P	EA	9.00	1.000	17/11/92	99/99/99	
550430108	SCREW CYL HD PHIL M3X8		38	P	EA	2.00	1.000	00/00/00	99/99/99	
550430116	SCREW CYL HD PHIL M3X16		56	P	EA	6.00	1.000	27/08/92	99/99/99	
550430508	SCREW FLAT HD PHIL M3X8		42	P	EA	2.00	1.000	00/00/00	99/99/99	
550430706	SCREW ECO-FIX M3X6		39	P	EA	4.00	1.000	15/10/91	99/99/99	
550440516	SCREW FLAT HD PHIL M4X16		43	P	EA	4.00	1.000	00/00/00	99/99/99	
550440605	SCREW OVAL HD PHIL M4X5		58	P	EA	8.00	1.000	14/11/91	99/99/99	
550440608	SCREW OVAL PHIL M4X8		41	P	EA	7.00	1.000	00/00/00	99/99/99	
551430400	WASHER SHAKEPROOF M3		45	P	EA	4.00	1.000	08/05/92	99/99/99	
551450400	WASHER SHAKEPROOF M5		32	P	EA	2.00	1.000	00/00/00	99/99/99	
552440300	NUT OPEN-END ACORN M4		48	P	EA	4.00	1.000	00/00/00	99/99/99	
554030101	NUT BANC-LOK TYPE MV M3		35	P	EA	5.00	1.000	00/00/00	99/99/99	
554435003	SCREW PT PHIL KA35X20		34	P	EA	4.00	1.000	00/00/00	99/99/99	
554435004	SCREW PT PHIL KA35X10		33	P	EA	4.00	1.000	00/00/00	99/99/99	
554440001	SCREW PT PHIL KA 40 X 12		59	P	EA	4.00	1.000	17/01/92	99/99/99	
560032008	SCREW PHILIPS 10-32X1/2		31	P	EA	2.00	1.000	00/00/00	99/99/99	
709300111	BRACKET 9300-1	B	25	B	EA	2.00	1.000	00/00/00	30/04/93	
709300131	FASTENER 9300-1	B	60	B	EA	1.00	1.000	02/03/92	30/04/93	
7093XX041	FOOT SUPPORT 93XX	D	5	B	EA	2.00	1.000	00/00/00	99/99/99	
7093XX051	FOOT 93XX	C	6	B	EA	2.00	1.000	00/00/00	99/99/99	
7093XX091	FRONT FRAME BRACKET 93XX	A	49	B	EA	4.00	1.000	03/09/91	99/99/99	
7093XX321	MAIN CARD STANDOFF 12MM	B	27	B	EA	6.00	1.000	27/08/92	99/99/99	
7093XX901	FAN 93XX-9 ASSEMBLY	B	28	B	EA	1.00	1.000	20/02/92	99/99/99	
7093XX931	INTERF. HOLE CLOSURE 93XX-9	C	61	B	EA	0.40	1.000	15/01/93	99/99/99	
709424096	INSERTION GUIDE FOR MC	E	24	B	EA	1.00	1.000	00/00/00	99/99/99	
780220030	BASE CARD POWER CABLE	A	17	B	EA	1.00	1.000	00/00/00	99/99/99	
780661104	FLAT CABLE 2X7 (4 CM)	A	18	B	EA	1.00	1.000	00/00/00	99/99/99	
780671107	FLAT CABLE 2X20 (7CM)	A	20	B	EA	1.00	1.000	05/11/91	99/99/99	
780681611	PS1715 LINE INPUT CABLE	D	15	B	EA	1.00	1.000	05/11/91	99/99/99	
780721105	FLAT CABLE 2X10 (5,5CM)	A	19	B	EA	1.00	1.000	15/10/91	99/99/99	
780754515	GROUND CABLE YEL/GREEN 15CM	A	16	B	EA	1.00	1.000	05/11/91	99/99/99	
93XX-DISPLAY	RASTER MONITOR KIT	C	50	B	EA	1.00	1.000	30/08/91	99/99/99	
93XX-PS1715	DSO POWER SUPPLY W/SHIELDING	C	9	B	EA	1.00	1.000	08/05/92	99/99/99	
FF93XX	FRONT FRAME DSO 93XX	A	1	R	EA	1.00	1.000	14/11/91	99/99/99	
LC93XX	LOWER COVER DSO 93XX	B	2	R	EA	1.00	1.000	14/11/91	99/99/99	
RP93XX-9	REAR PANEL 93XX-9	D	21	R	EA	1.00	1.000	00/00/00	99/99/99	
UC93XX	UPPER COVER DSO 93XX	A	3	R	EA	1.00	1.000	14/11/91	99/99/99	

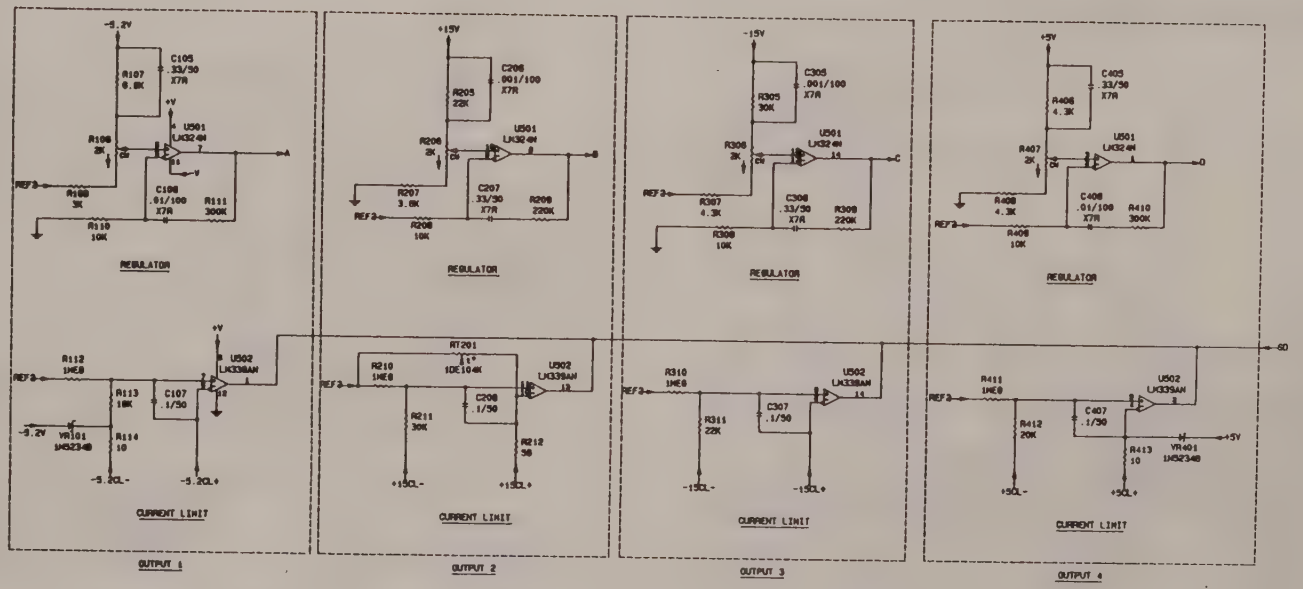
SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 2
SUBASSEMBLIES
PART: ACCESSORIES-9310
DESC: ACCESSORIES FOR 9310 UOM: EA SC: R REV: 8

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
407099008	PLUG FOR AC LINE -ENGLAND		3	P	EA	0.05	1.000	04/10/91	99/99/99	
433162500	FUSE 250V/5A		4	P	EA	2.00	1.000	09/06/92	99/99/99	
589202100	AC CORD/PLUG FOR FRANCE		6	P	EA	0.05	1.000	04/10/91	99/99/99	
589202200	AC CORD/PLUG FOR GERMANY		7	P	EA	0.25	1.000	04/10/91	99/99/99	
589203100	AC CORD/"SEV-ASE" PLUG		8	P	EA	0.10	1.000	04/10/91	99/99/99	
589203218	AC CORD/US-CANADA PLUG		9	P	EA	0.55	1.000	04/10/91	99/99/99	
597930001	CARTON FOR 93XX		12	B	EA	1.00	1.000	02/01/92	99/99/99	
597930002	ETHAFOAM FOR 93XX		13	B	EA	2.00	1.000	02/01/92	99/99/99	
597940014	PLASTIC BAG FOR 94XX & 93XX		10	B	EA	2.00	1.000	20/12/91	99/99/99	
597940015	MANUAL/ACCESSORY CTN 9400		11	B	EA	2.00	1.000	20/12/91	99/99/99	
7093XX061	FRONT COVER 93XX	C	1	B	EA	1.00	1.000	00/00/00	99/99/99	
931X-OM-E	931X OPERATOR'S MANUAL - ENG.	A	14	B	EA	0.60	1.000	05/03/93	99/99/99	
931X-OM-F	931X OPERATOR'S MANUAL - FREN.	A	20	B	EA	0.10	1.000	05/03/93	99/99/99	
931X-OM-G	931X OPERATOR'S MANUAL - GERM.	A	19	B	EA	0.20	1.000	05/03/93	99/99/99	
931X-OM-I	931X OPERATOR'S MANUAL - ITAL.	A	21	B	EA	0.10	1.000	05/03/93	99/99/99	
931X-RCM-E	931X SERIES REMOTE CONTROL MAN	A	18	B	EA	1.00	1.000	15/01/93	99/99/99	
PP001	PASSIVE PROBE 10 MOHM 10:1	A	2	B	EA	2.00	1.000	26/03/93	99/99/99	


AC INPUT (J7)
115/230VAC
4.0A/2.0A
47 - 63 Hz
REVISIONS
LTR
DESCRIPTION
EC
TC
DWN/DATE
APP
NOTICE: THIS DESIGN IS THE SOLE PROPERTY OF LECROY CORP
IT CONTAINS PROPRIETARY INFORMATION AND IS FURNISHED
WITH THE UNDERSTANDING THAT IT IS NOT TO BE USED, DIS-
CLOSED OR REPRODUCED IN ANY MANNER WITHOUT THE APPROVAL
OF LECROY CORPORATION.
LeCroy CORPORATION
DRAWN
J-P-VITTET
CHKD
J-P-VITTET
DATE
10-APR-92
MODEL : 93xx-1715
POWER SUPPLY
DWG NO: ----------
SH 1 OF 2
ECO : ----

REVISIONS					
LTR	DESCRIPTION	EC	TC	DWN	APP
—	SEE SHEET 1 FOR REVISIONS	—	—	—	—



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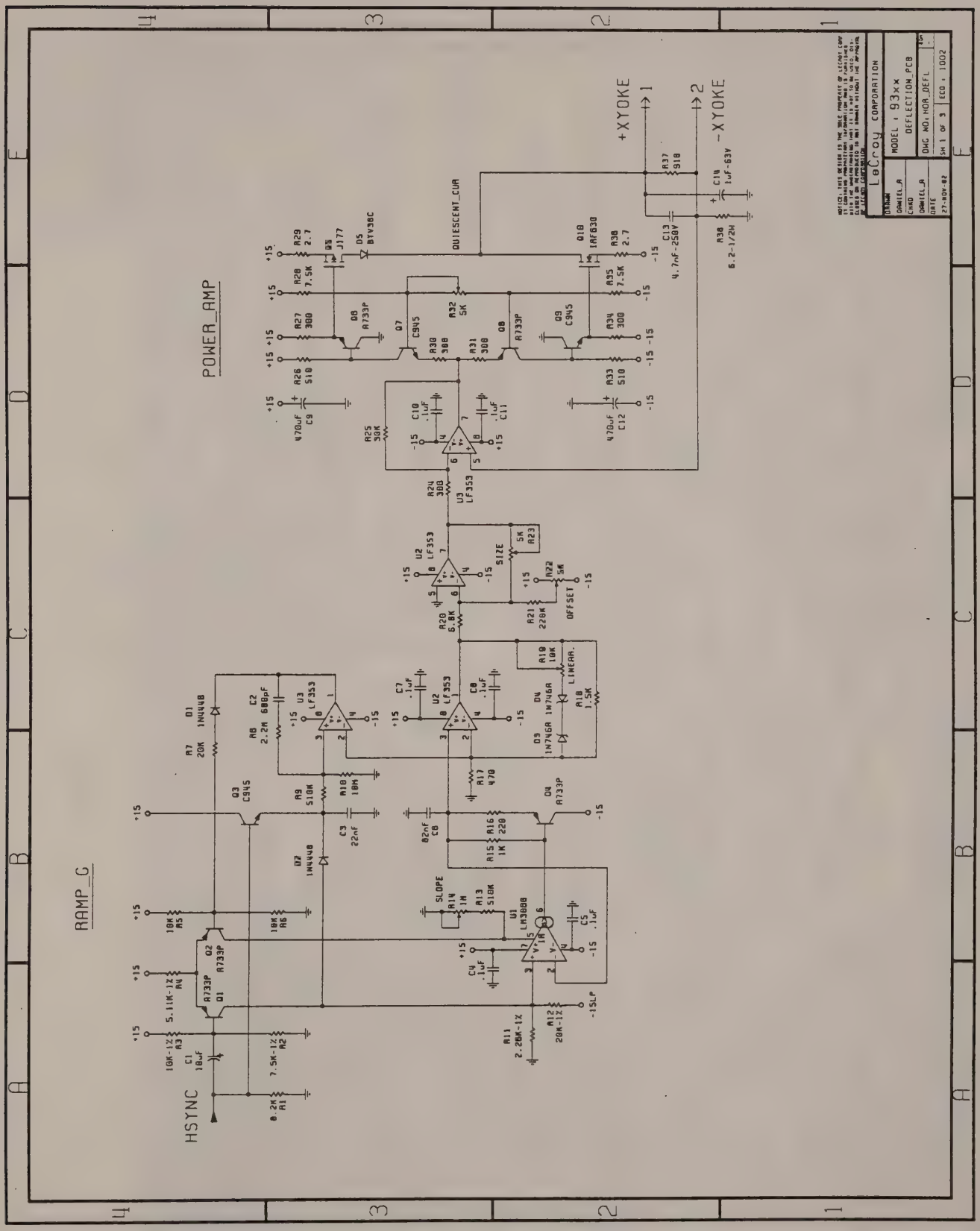
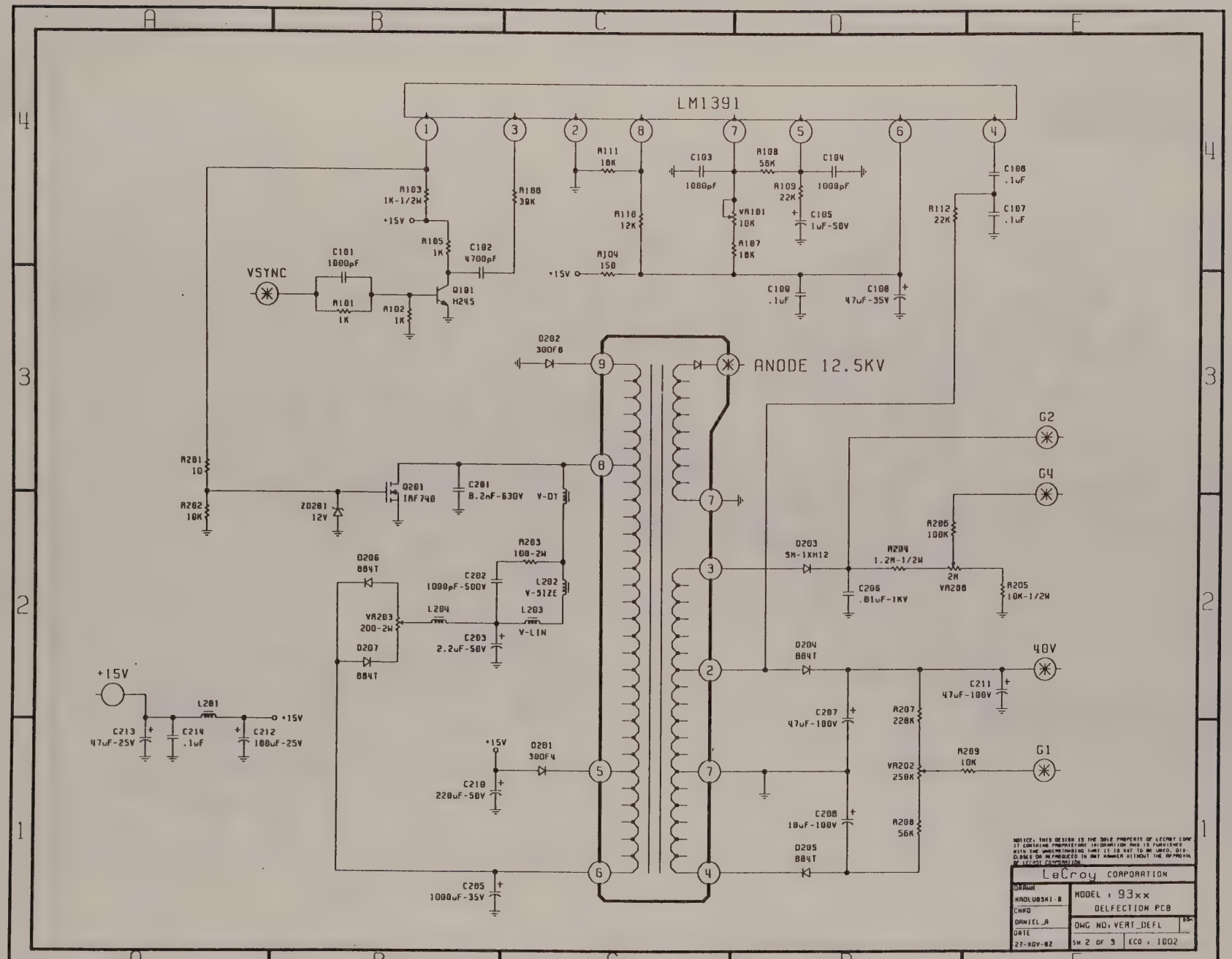
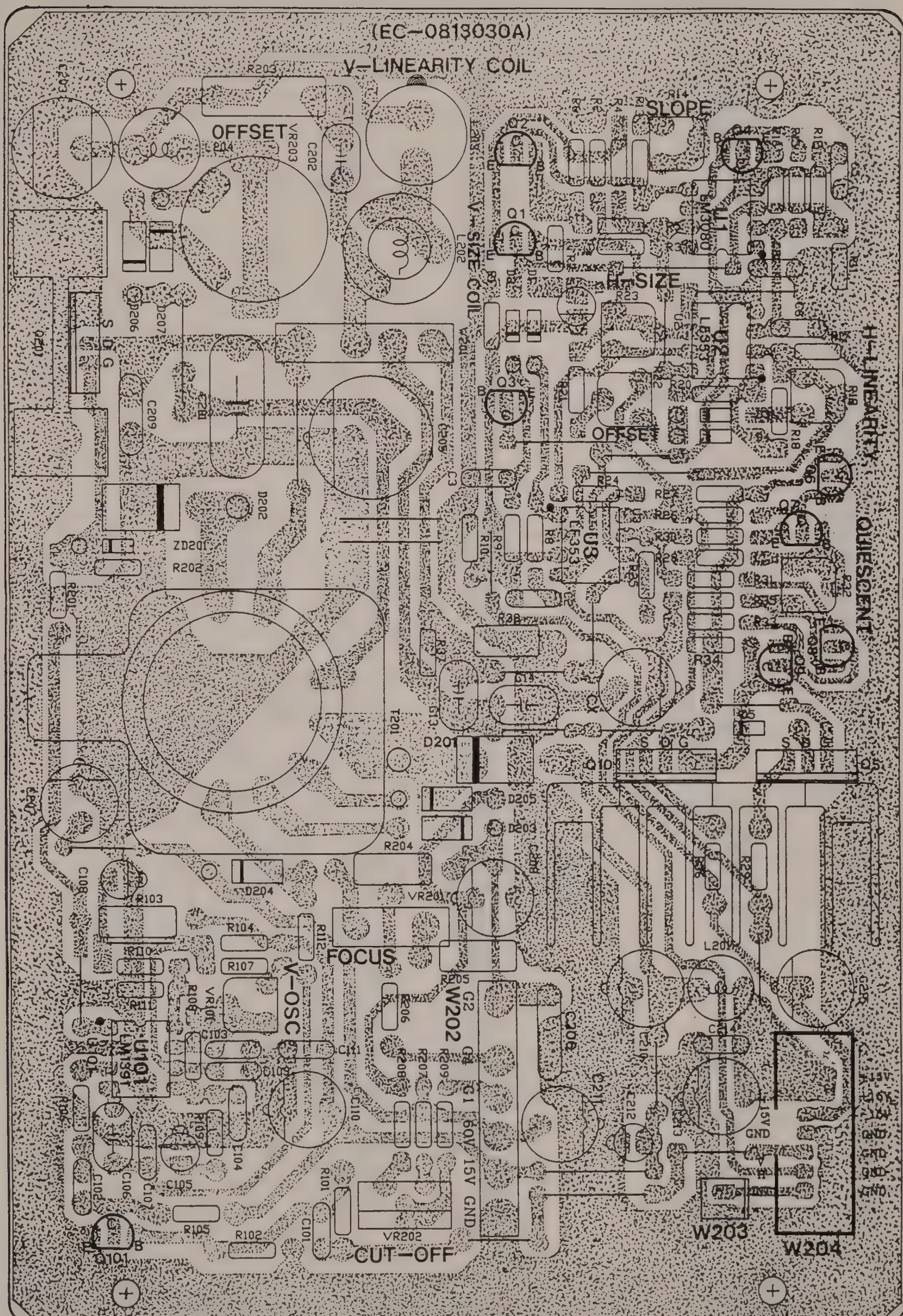
LeCroy CORPORATION		
DRAWN J-P-VITTET	MODEL : 93xx-1715 POWER SUPPLY	
CHKD J-P-VITTET	DWG NO: ----------	BOM --
DATE 10-APR-92	SH 2 OF 2	ECO : ----


RAMP_G
POWER_AMP
HSYNC
+XYOKE
-XYOKE
QUIESCENT_CUR
SIZE
OFFSET
SLOPE
LeCroy CORPORATION
MODEL : 93xx
DEFLECTION_PCB
DWG NO: MOR_DEFL
SH 1 OF 3
ECO : 1002
27-NOV-92

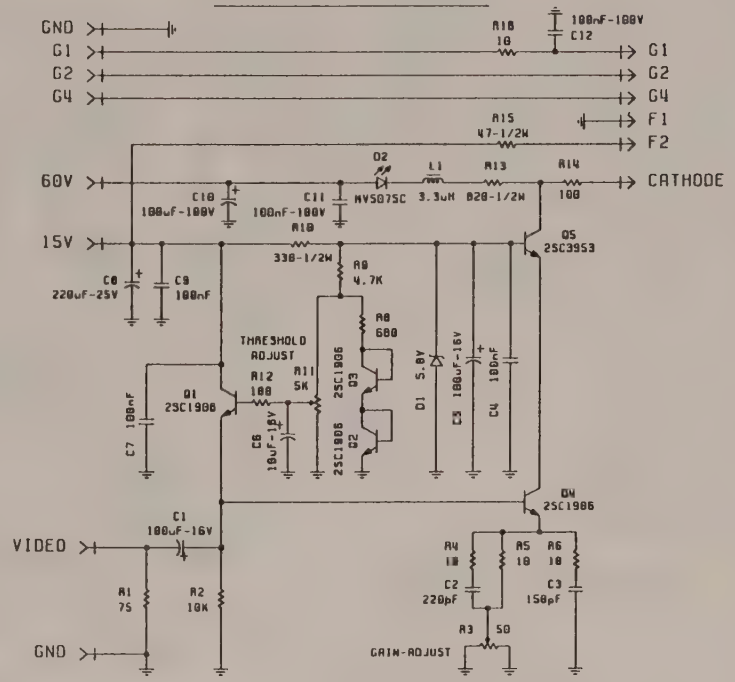

LM1391
ANODE 12.5KV
G2
G4
G1
40V
VSYNC
+15V
R103 1K-1/2W
R105 1K
C102 4700pF
C101 1000pF
R101 1K
R102 1K
Q101 H245
R111 18K
R110 12K
C103 1000pF
R108 56K
R109 22K
VR101 10K
R107 18K
C104 1000pF
C105 1uF-50V
R104 150
C109 .1uF
C108 47uF-35V
R112 22K
C106 .1uF
C107 .1uF
R106 39K
D202 30DF6
R201 10
R202 10K
Z0201 12V
Q201 IRF740
C201 8.2nF-630V
V-DT
R203 100-2W
D206 884T
C202 1000pF-500V
L202 V-SIZE
VR203 200-2W
L204
L203 V-LIN
C203 2.2uF-50V
D207 884T
D203 SM-1XH12
R204 1.2M-1/2W
R206 100K
2M VR208
R205 10K-1/2W
C206 .01uF-1KV
D204 884T
C211 47uF-100V
C207 47uF-100V
R207 220K
R209 10K
VR202 250K
C208 10uF-100V
R208 56K
D205 884T
L201
C213 47uF-25V
C214 .1uF
C212 100uF-25V
D201 30DF4
C210 220uF-50V
C205 1000uF-35V
LeCroy CORPORATION
DRAWN KADLUBSKI-B
CHKD DANIEL_A
DATE 27-NOV-92
MODEL : 93xx
DEFLECTION PCB
DWG NO: VERT_DEFL
SH 2 OF 3
ECO : 1002


(EC-0813030A)
V-LINEARITY COIL
OFFSET
SLOPE
V-SIZE COIL
H-SIZE
H-LINEARITY
OFFSET
QUIESCENT
FOCUS
V-OSC
W202
CUT-OFF
W203
W204

C1	10uF	R1	8.2K	VR202	250K
C2	680pF	R2	7.5K-1%	VR203	200-2W
C3	22nF	R3	10K-1%	VR206	2M
C4	.1uF	R4	5.11K-1%	ZD201	12V
C5	.1uF	R5	10K		
C6	82nF	R6	10K		
C7	.1uF	R7	20K		
C8	.1uF	R8	2.2M		
C9	470uF	R9	510K		
C10	.1uF	R10	10M		
C11	.1uF	R11	2.26K-1%		
C12	470uF	R12	20K-1%		
C13	4.7nF-250V	R13	510K		
C14	1uF-63V	R14	1M		
C101	1000pF	R15	1K		
C102	4700pF	R16	220		
C103	1000pF	R17	470		
C104	1000pF	R18	1.5K		
C105	1uF-50V	R19	10K		
C106	.1uF	R20	6.8K		
C107	.1uF	R21	220K		
C108	47uF-35V	R22	5K		
C109	.1uF	R23	5K		
C201	8.2nF-630V	R24	300		
C202	1000pF-500V	R25	30K		
C203	2.2uF-50V	R26	510		
C205	1000uF-35V	R27	300		
C206	.01uF-1KV	R28	7.5K		
C207	47uF-100V	R29	2.7		
C208	10uF-100V	R30	300		
C210	220uF-50V	R31	300		
C211	47uF-100V	R32	5K		
C212	100uF-25V	R33	510		
C213	47uF-25V	R34	300		
C214	.1uF	R35	7.5K		
D1	1N4448	R36	2.7		
D2	1N4448	R37	910		
D3	1N746A	R38	6.2-1/2W		
D4	1N746A	R101	1K		
D5	BYV36C	R102	1K		
D201	30DF4	R103	1K-1/2W		
D202	30DF6	R104	150		
D203	SM-1XH12	R105	1K		
D204	BB4T	R106	39K		
D205	BB4T	R107	18K		
D206	BB4T	R108	56K		
D207	BB4T	R109	22K		
L201	5nH	R110	12K		
L202	V-DY	R111	18K		
L202	V-SIZE	R112	22K		
L203	V-LIN	R201	10		
L204	5nH	R202	10K		
Q1	A733P	R203	100-2W		
Q2	A733P	R204	1.2M-1/2W		
Q3	C945	R205	10K-1/2W		
Q4	A733P	R206	100K		
Q5	J177	R207	220K		
Q6	A733P	R208	56K		
Q7	C945	R209	10K		
Q8	A733P	T201	HT		
Q9	C945	U1	LM3080		
Q10	IRF630	U2	LF353		
Q101	H245	U3	LF353		
Q201	IRF740	VR101	10K		

PANEL : INT_CTR

CRT CONTROL FOR ECM-90088



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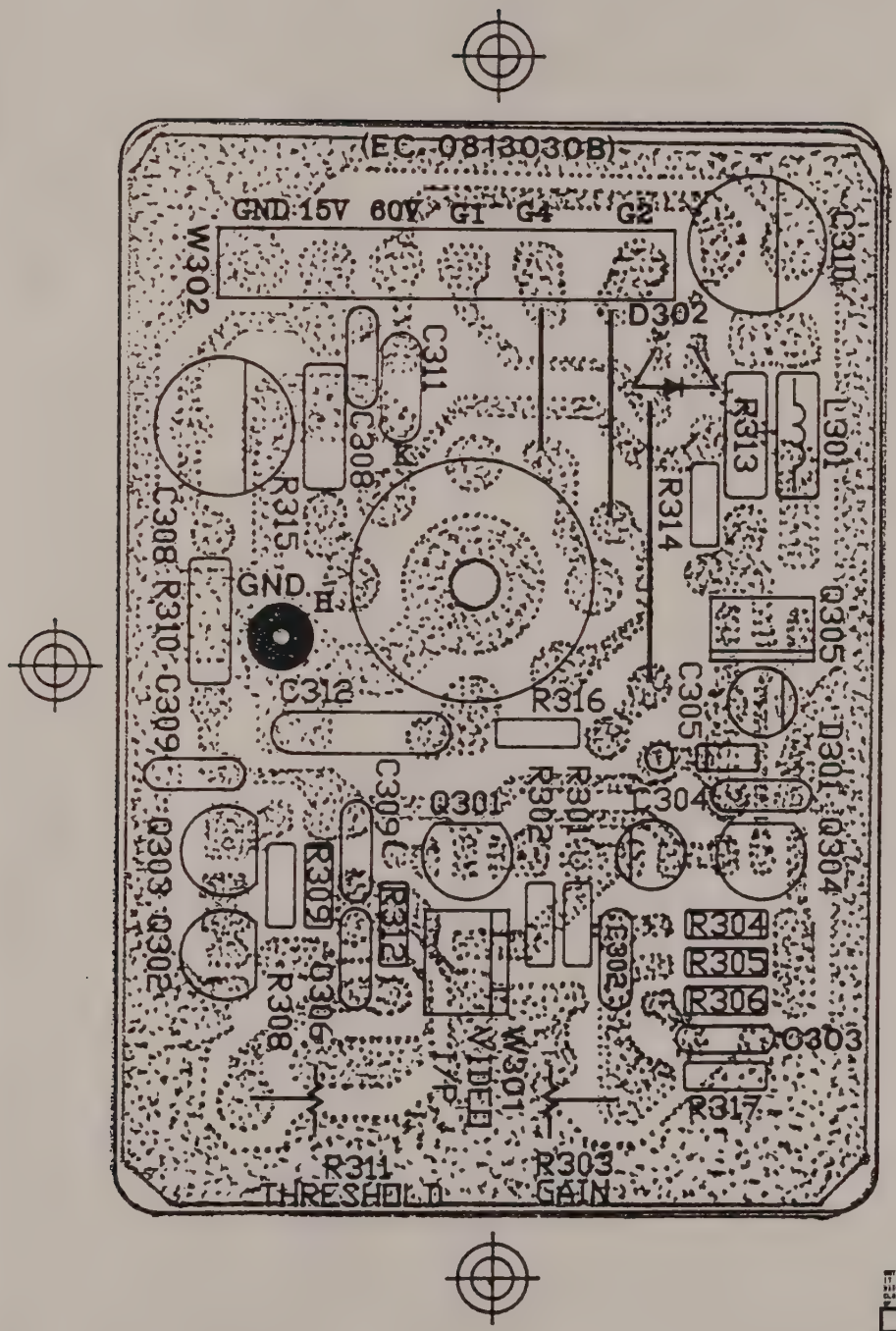
OF LECROY CORPORATION.

LeCroy CORPORATION

DRAWN DANIEL_A	MODEL : 93xx VIDEO
CHKD DANIEL_A	DWG NO: ----------
DATE 27-NOV-92	SH 3 OF 3 ECO : 1002



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LeCroy CORPORATION	
DRAWN CF	MODEL : 93xx VIDEO
CHKD CS	DWG NO: ---------- REV
DATE 8-JUN-93	SH 1 OF 1 ECO : -----

Comp-File_Intensity : page 1

C1	100uF-16V
C2	220pF
C3	150pF
C4	100nF
C5	100uF-16V
C6	10uF-16V
C7	100nF
C8	220uF-25V
C9	100nF
C10	100uF-100V
C11	100nF-100V
C12	100nF-100V
D1	5.0V
D2	MV5075C
L1	3.3uH
Q1	2SC1906
Q2	2SC1906
Q3	2SC1906
Q4	2SC1906
Q5	2SC3953
R1	75
R2	10K
R3	50
R4	10
R5	10
R6	10
R8	680
R9	4.7K
R10	330-1/2W
R11	5K
R12	100
R13	820-1/2W
R14	100
R15	47-1/2W
R16	10

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 1
FINISHED GOODS-MANUFACTURED
PART: 93XX-FDGP
DESC: GRAPHIC PRINTER & FLOPPY DISK UOM: EA SC: M REV: 3

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
334000402	THERMAL PAPER FOR SEIKO PRINT		26	P	EA	1.00	1.000	20/11/92	99/99/99	
334000832	THERMAL PRINTER UNIT		23	P	EA	1.00	1.000	00/00/00	99/99/99	
335023203	FLOPPY DISK DRIVE 31/2"		9	P	EA	1.00	1.000	00/00/00	99/99/99	
530040005	SLIDE LATCH TAB STYLE		27	P	EA	2.00	1.000	25/11/92	99/99/99	
550425104	SCREW CYL HD PHIL M2,5X4		6	P	EA	4.00	1.000	00/00/00	99/99/99	
550430106	SCREW CYL HD PHIL M3X6		5	P	EA	8.00	1.000	00/00/00	99/99/99	
551430100	FLAT WASHER M3		18	P	EA	3.00	1.000	00/00/00	99/99/99	
552430300	NUT OPEN-END ACORN M3		19	P	EA	3.00	1.000	00/00/00	99/99/99	
554030101	NUT BANC-LOK TYPE MV M3		4	P	EA	2.00	1.000	00/00/00	99/99/99	
554430002	SCREW S/TAP PHIL M3X5		7	P	EA	8.00	1.000	25/11/92	99/99/99	
709450523	PUSH SWITCH EXTENDER	D	28	B	EA	1.00	1.000	25/11/92	99/99/99	
70FD01021	FLOPPY DISK DRIVE SUPPORT	B	2	B	EA	1.00	1.000	00/00/00	99/99/99	
70FD01031	FLOPPY DISK DRIVE FRAME	B	3	B	EA	1.00	1.000	00/00/00	99/99/99	
70GP01031	GRAPHIC PRINTER FRAME	C	14	B	EA	1.00	1.000	00/00/00	99/99/99	
70GP01041	GRAPHIC PRINTER COVER AXLE	B	15	B	EA	1.00	1.000	00/00/00	99/99/99	
70GP01051	GRAPHIC PRINTER CUTTER	A	16	B	EA	1.00	1.000	00/00/00	99/99/99	
70GP01061	GRAPHIC PRINTER SWITCH BUTTON	B	17	B	EA	1.00	1.000	00/00/00	99/99/99	
780210030	DISPLAY POWER CABLE	A	22	B	EA	1.00	1.000	00/00/00	99/99/99	
780721022	FLAT CABLE 2X10 (22CM)	A	21	B	EA	1.00	1.000	00/00/00	99/99/99	
780791604	FLAT CABLE 2X13 (4CM)	A	20	B	EA	1.00	1.000	00/00/00	99/99/99	
780791630	FLAT CABLE 2X13 (30CM)	A	8	B	EA	1.00	1.000	25/11/92	99/99/99	
780801012	FLAT CABLE 2X20 (3 CONNECT.)	A	11	B	EA	1.00	1.000	00/00/00	99/99/99	
BOX-GP01	GP01 GRAPHIC PRINTER BOX	B	12	R	EA	1.00	1.000	00/00/00	99/99/99	
COVER-GP01	GP01 GRAPHIC PRINTER COVER	B	13	R	EA	1.00	1.000	00/00/00	99/99/99	
CUP-FD01	FD01 FLOPPY DISK DRIVE CUP	B	1	R	EA	1.00	1.000	00/00/00	99/99/99	
F9300-6	CENTRONICS/FLOPPY/PRINTER INT.	A	10	R	EA	1.00	1.000	00/00/00	99/99/99	
F9300-7	LTP 5446 PRINTER CONTROLLER	2	24	R	EA	1.00	1.000	00/00/00	99/99/99	
UC93XX-FDGP	UPPER COVER FOR FD/GP OPTIONS	A	25	R	EA	1.00	1.000	00/00/00	99/99/99	

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 1
FINISHED GOODS-MANUFACTURED
PART: 93XX-FD01
DESC: FLOPPY DISK UOM: EA SC: M REV: 2

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
335023203	FLOPPY DISK DRIVE 31/2"		10	P	EA	1.00	1.000	00/00/00	99/99/99	
550425104	SCREW CYL HD PHIL M2,5X4		7	P	EA	4.00	1.000	00/00/00	99/99/99	
550430106	SCREW CYL HD PHIL M3X6		6	P	EA	2.00	1.000	00/00/00	99/99/99	
554030101	NUT BANC-LOK TYPE MV M3		5	P	EA	2.00	1.000	00/00/00	99/99/99	
554430002	SCREW S/TAP PHIL M3X5		8	P	EA	4.00	1.000	25/11/92	99/99/99	
70FD01021	FLOPPY DISK DRIVE SUPPORT	B	2	B	EA	1.00	1.000	00/00/00	99/99/99	
70FD01031	FLOPPY DISK DRIVE FRAME	B	3	B	EA	1.00	1.000	00/00/00	99/99/99	
780791630	FLAT CABLE 2X13 (30CM)	A	9	B	EA	1.00	1.000	25/11/92	99/99/99	
780801012	FLAT CABLE 2X20 (3 CONNECT.)	A	12	B	EA	1.00	1.000	00/00/00	99/99/99	
CUP-FD01	FD01 FLOPPY DISK DRIVE CUP	B	1	R	EA	1.00	1.000	00/00/00	99/99/99	
F9300-6	CENTRONICS/FLOPPY/PRINTER INT.	A	11	R	EA	1.00	1.000	00/00/00	99/99/99	
UC93XX-FD01	UPPER COVER FOR FD01 OPTION	A	4	R	EA	1.00	1.000	00/00/00	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 29/03/93

CLASS CODE: 1
FINISHED GOODS-MANUFACTURED
PART: 93XX-GP01
DESC: GRAPHICS PRINTER UOM: EA SC: M REV: 3

COMPONENT PART	DESCRIPTION	RV	ITEM NUMBR	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
334000402	THERMAL PAPER FOR SEIKO PRINT		19	P	EA	1.00	1.000	20/11/92	99/99/99	
334000832	THERMAL PRINTER UNIT		17	P	EA	1.00	1.000	00/00/00	99/99/99	
530040005	SLIDE LATCH TAB STYLE		20	P	EA	2.00	1.000	25/11/92	99/99/99	
550430106	SCREW CYL HD PHIL M3X6		11	P	EA	6.00	1.000	00/00/00	99/99/99	
551430100	FLAT WASHER M3		10	P	EA	3.00	1.000	00/00/00	99/99/99	
552430300	NUT OPEN-END ACORN M3		12	P	EA	3.00	1.000	00/00/00	99/99/99	
554430002	SCREW S/TAP PHIL M3X5		13	P	EA	4.00	1.000	25/11/92	99/99/99	
709450523	PUSH SWITCH EXTENDER	D	21	B	EA	1.00	1.000	25/11/92	99/99/99	
70GP01031	GRAPHIC PRINTER FRAME	C	5	B	EA	1.00	1.000	00/00/00	99/99/99	
70GP01041	GRAPHIC PRINTER COVER AXLE	B	6	B	EA	1.00	1.000	00/00/00	99/99/99	
70GP01051	GRAPHIC PRINTER CUTTER	A	7	B	EA	1.00	1.000	00/00/00	99/99/99	
70GP01061	GRAPHIC PRINTER SWITCH BUTTON	B	8	B	EA	1.00	1.000	00/00/00	99/99/99	
780210030	DISPLAY POWER CABLE	A	16	B	EA	1.00	1.000	00/00/00	99/99/99	
780721022	FLAT CABLE 2X10 (22CM)	A	15	B	EA	1.00	1.000	00/00/00	99/99/99	
780791604	FLAT CABLE 2X13 (4CM)	A	14	B	EA	1.00	1.000	00/00/00	99/99/99	
780801012	FLAT CABLE 2X20 (3 CONNECT.)	A	2	B	EA	1.00	1.000	00/00/00	99/99/99	
BOX-GP01	GP01 GRAPHIC PRINTER BOX	B	3	R	EA	1.00	1.000	00/00/00	99/99/99	
COVER-GP01	GP01 GRAPHIC PRINTER COVER	B	4	R	EA	1.00	1.000	00/00/00	99/99/99	
F9300-6	CENTRONICS/FLOPPY/PRINTER INT.	A	1	R	EA	1.00	1.000	00/00/00	99/99/99	
F9300-7	LTP 5446 PRINTER CONTROLLER	2	18	R	EA	1.00	1.000	00/00/00	99/99/99	
UC93XX-GP01	UPPER COVER FOR GP01 OPTION	A	9	R	EA	1.00	1.000	00/00/00	99/99/99	

9310/9310M/9310L

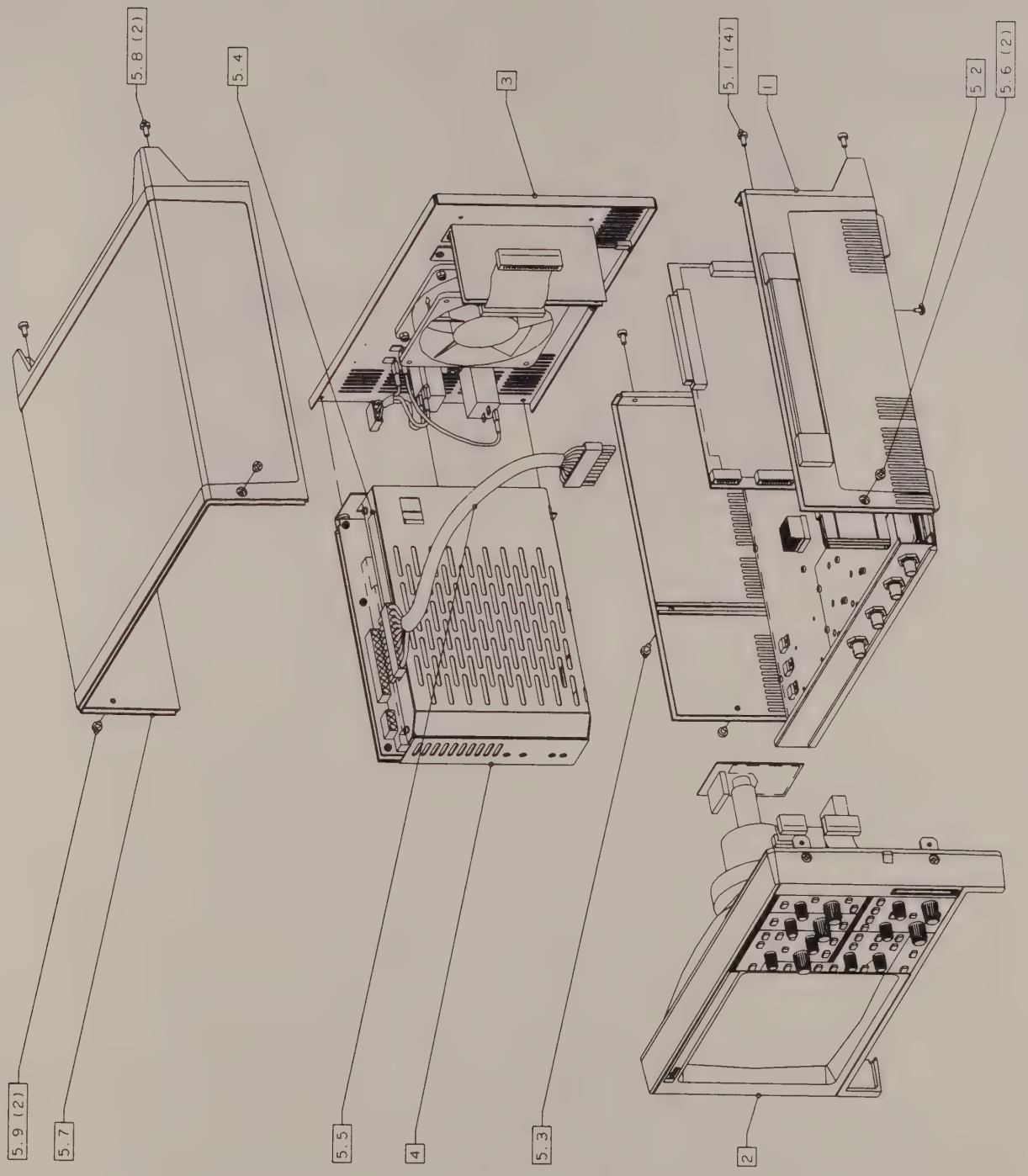


FIGURE 9.1: 9310 DSO EXPLODED VIEW

	9310 Assembly		Quantity
1.	9310 lower cover assembly		1
2.	9310 front frame assembly		1
3.	Rear panel assembly		1
4.	PS 1715 power supply	93XX-PS 1715	1
5.1	Screw oval head M4x8	550 440 608	4
5.2	Screw Eco-Fix M3x6	550 430 706	1
5.3	Screw oval head M4x8	550 440 608	1
5.4	Label "Danger ... only"	377 051 005	1
5.5	Main card power cable	780 220 030	1
5.6	Screw oval head M4x5	550 440 605	2
5.7	Upper cover	UC 93XX	1
5.8	Screw oval head M4x8	550 440 608	2
5.9	Screw oval head M4x5	550 440 605	2

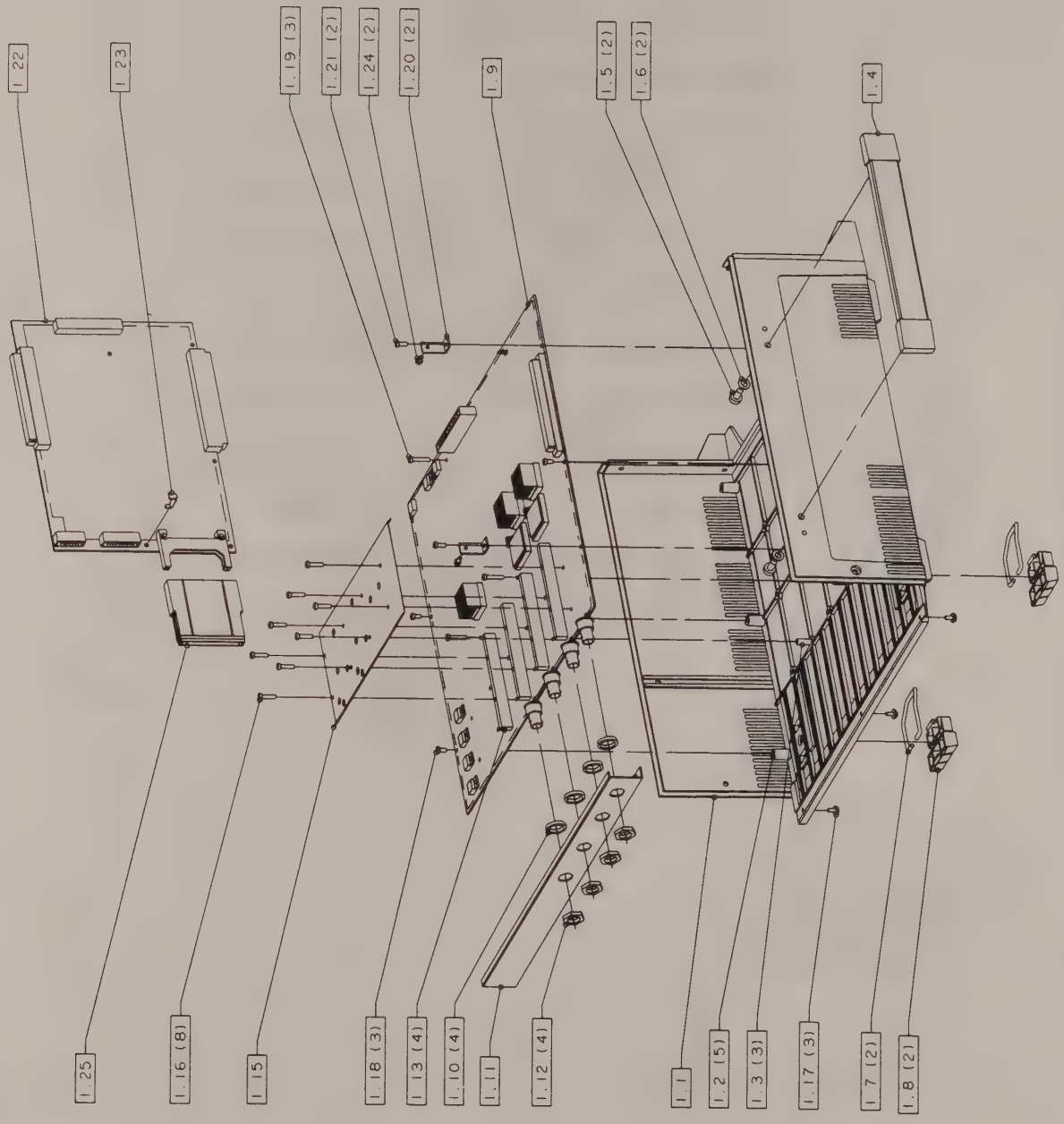


FIGURE 9.2: 9310 LOWER COVER EXPLODED VIEW

1. 9310 Lower Cover Assembly			Quantity
1.1	Lower cover	LC 93XX	1
1.2	Nut Banc-Lock M3	554 030 101	5
1.3	Main card standoff M3	709 3XX 321	3
1.4	Handle with caps	530 301 009	1
1.5	Screw cyl. head 10-32 x 1/2	560 032 008	2
1.6	Lockwasher M5	551 450 400	2
1.7	Foot	709 3XX 051	2
1.8	Foot support	709 3XX 041	2
1.9	Main board 9310/9310M/9310L F9310-3 or F9310M-3 or F9310L-3		1
1.10	BNC Spacer	709 3XX 331	6
1.11	Main board panel 9310	FP9310-3	1
1.12	Nut	403 110 303	6
1.13	Lower separation shielding	709 314 341	6
1.15	Upper cover shielding	709 314 321	1
1.16	Screw cyl. head M3x14	550 430 114	12
1.17	Screw Eco-Fix M3x6	550 430 706	3
1.18	Screw cyl. head M3x6	550 430 106	3
1.19	" " " M3x16	550 430 116	3
1.20	Processor bracket	709 300 111	2
1.21	Screw cyl. head M3x8	550 430 108	2
1.22	Processor card	F9300-1 or F9314M-1	1
1.23	Processor fastener	709 300 131	1
1.24	Screw cyl. head M3x6	550 430 106	2
1.25	Memory card insertion guide	709 424 096	1

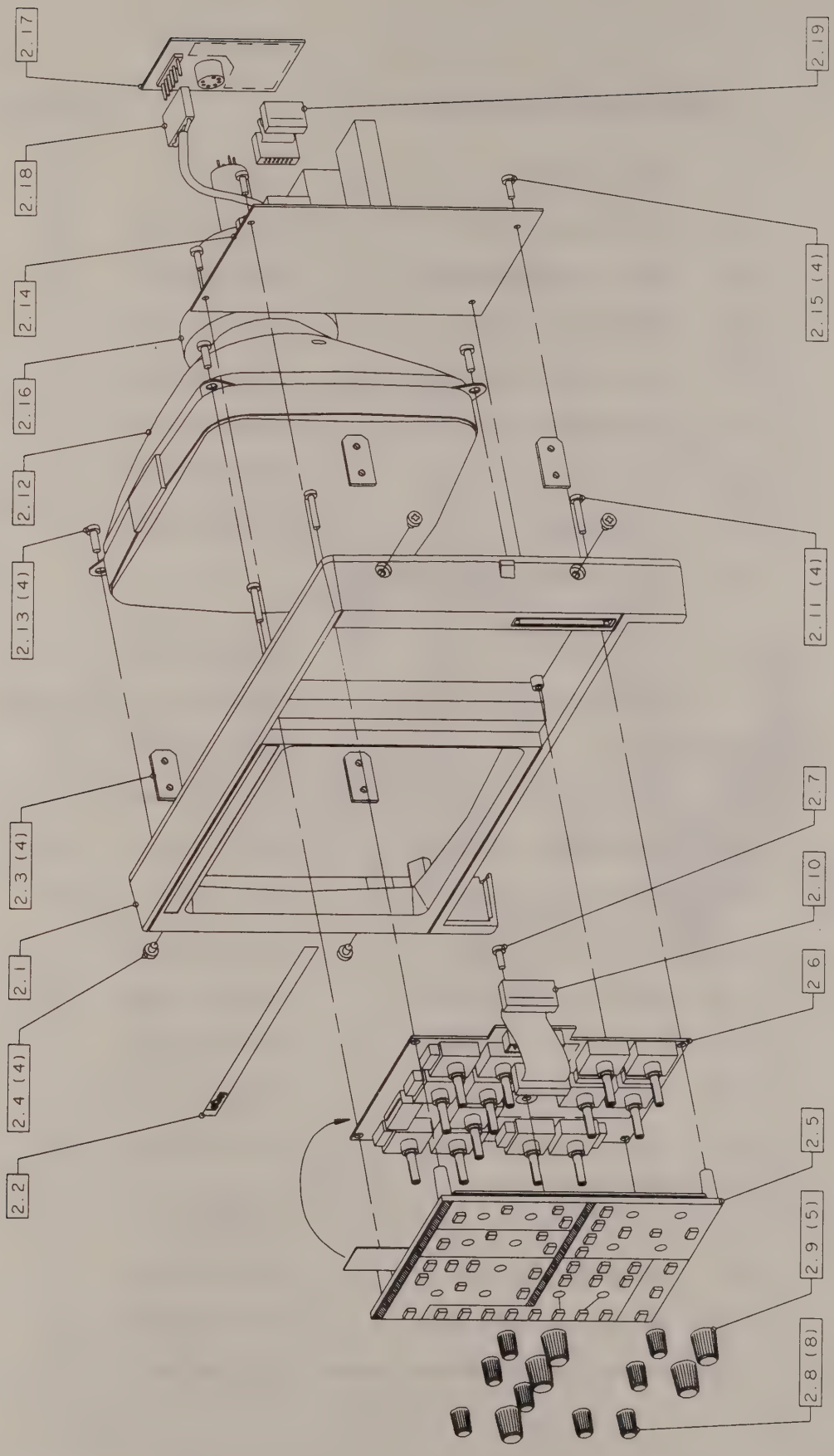


FIGURE 9.3: 9310 FRONT FRAME EXPLODED VIEW

2. 9310 Front Panel Assembly			Quantity
2.1	Front frame	FF 9310	1
2.2	Front label	709 310 013	1
		or 709 310 M13	1
		or 709 310 L13	1
2.3	Front frame bracket	709 3XX 091	4
2.4	Screw oval head M4x5	550 440 605	4
2.5	Front panel keyboard ass'y	729 310 503	1
2.6	Front panel pcb ass'y	F9310-5	1
2.7	Screw PT KA 35x10	554 435 004	1
2.8	Knob diameter 10mm	709 3XX 511	7
2.9	" " 14mm	709 3XX 521	4
2.10	20 lines flat cable	780 721 105	1
2.11	Screw PT KA 35x20	554 435 003	4
2.12	9 inch CRT	93XX-CRT	1
2.13	Screw PT KA 40x12	554 440 001	4
2.14	Deflection board	93XX-Deflection	1
2.15	Screw PT KA 35x10	554 435 004	4
2.16	Deflection yoke	93XX-Yoke	1
2.17	Video board	93XX-Video	1
2.18	Monitor cable		1
2.19	14 lines flat cable	780 661 104	1

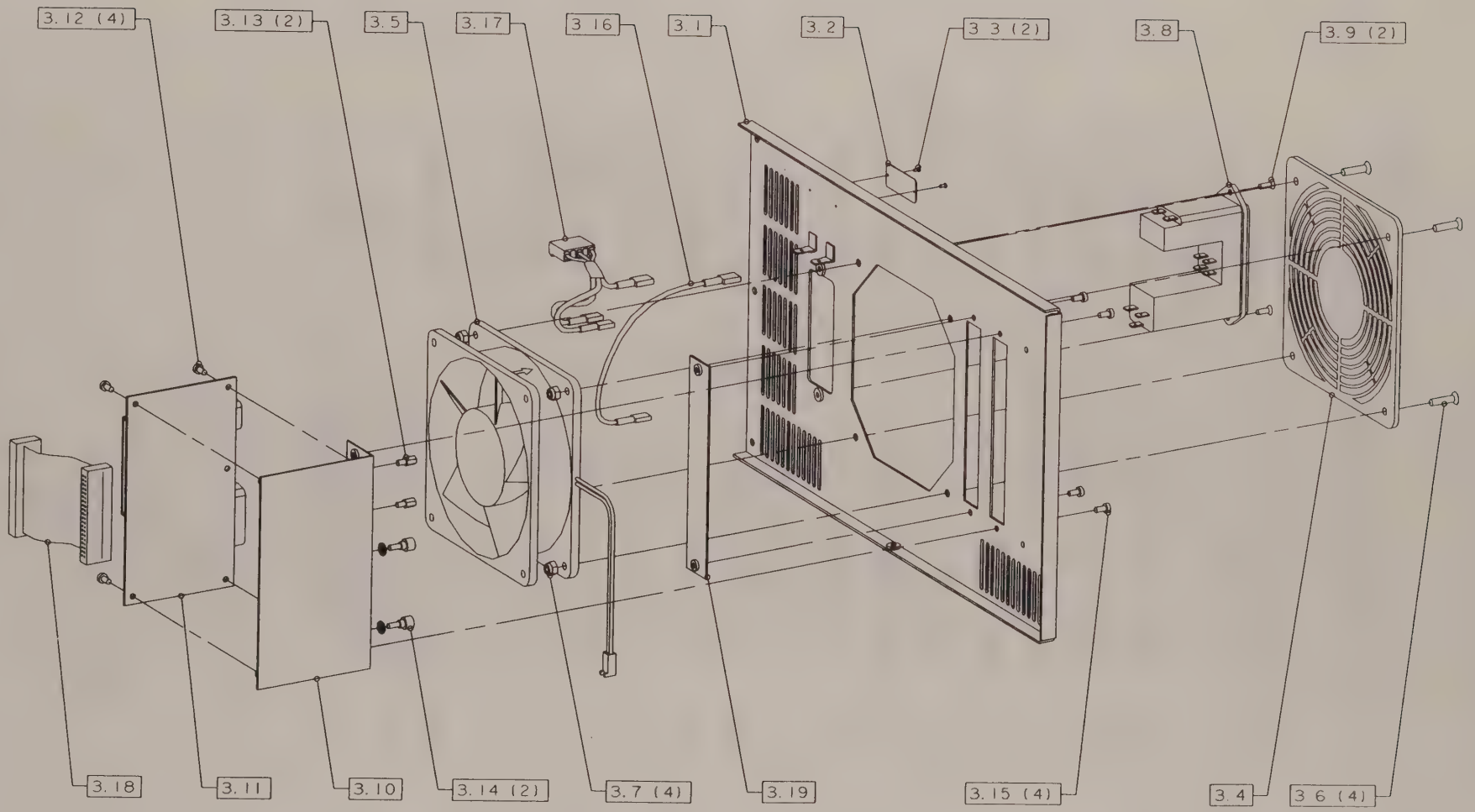


FIGURE 9.4: 9310 REAR PANEL EXPLODED VIEW

3. 9310 Rear Panel Assembly			Quantity
3.1	Rear panel	RP 93XX-9	1
3.2	Serial number plate	709 310 913	1
3.3	Taping screw	554 500 001	2
3.4	Fan grid	530 904 000	1
3.5	Fan asssembly	709 3XX 901	1
3.6	Screw flat head M4x16	550 440 516	4
3.7	Nut acom M4	552 440 300	4
3.8	Line input module Fuse holder Fuse 5A / 250 V	434 690 002 407 036 002 433 162 500	1 1 2
3.9	Screw flat head M3x8	550 430 508	2
3.10	Interface card bracket	709 300 411	1
3.11	Interface card	F9300-4	1
3.12	Screw cyl. head M3x6	550 430 106	4
3.13	Screw lock	455 980 002	2
3.14	Screw lock and washer	-	2
3.15	Screw cyl. head M3x6	550 430 106	2
3.16	Ground wire cable	780 754 515	1
3.17	Line input cable	780 681 611	1
3.18	40 lines flat cable	780 671 107	1
3.19	Interface hole closure	709 3XX 931	1

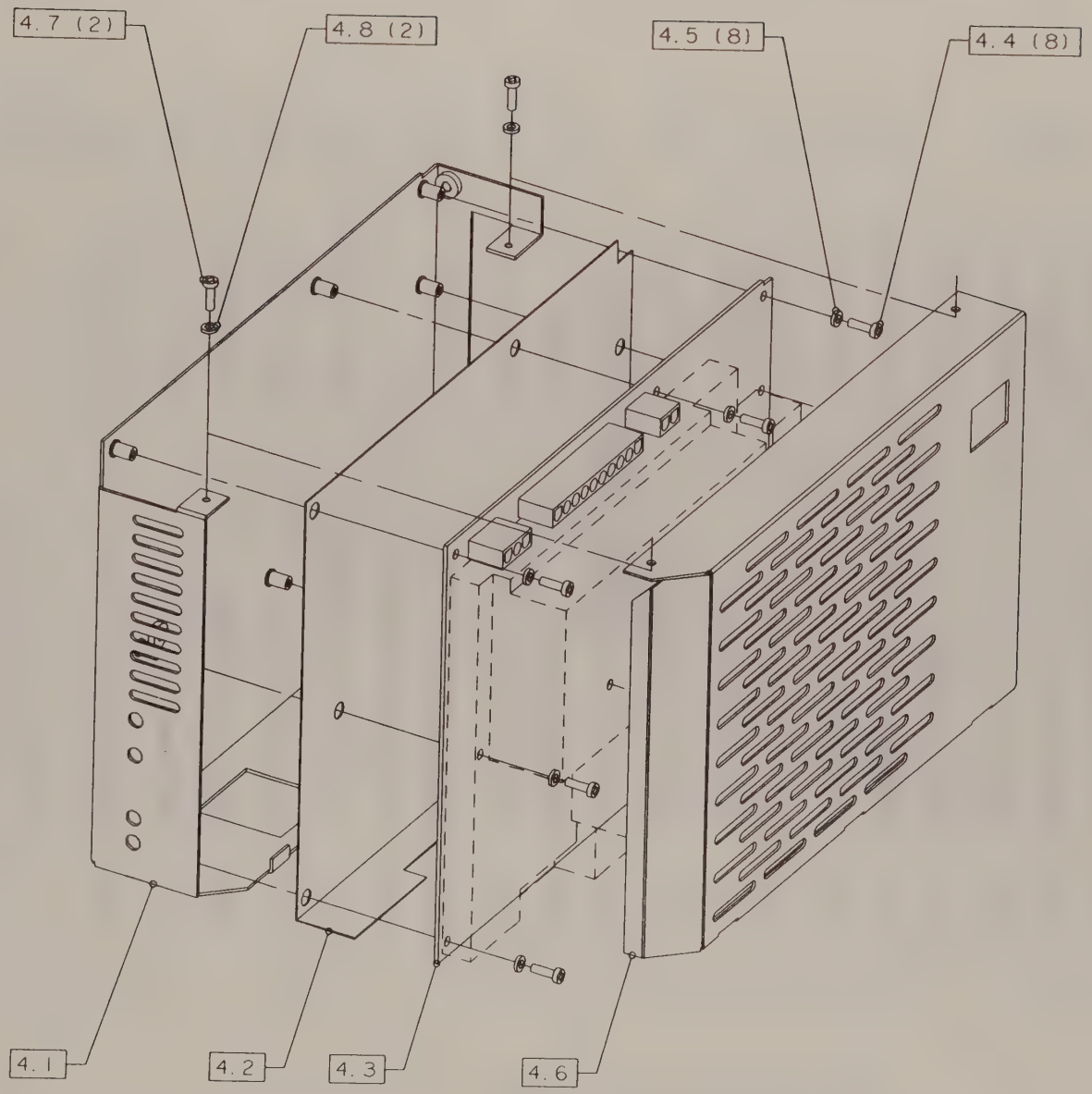


FIGURE 9.5: 93XX-PSI715 POWER SUPPLY EXPLODED VIEW

4.	PS 1715 power supply 93XX-PS1715		Quantity
4.1	Chassis	709 3XX 071	1
4.2	Insulator	-	1
4.3	Power supply board	93XX-PS 1701	1
4.4	Screw cyl. head M3x6	550 430 106	8
4.5	Lockwasher M3	551 430 400	8
4.6	shielding	709 3XX 081	1
4.7	Screw cyl. head M3x6	550 430 106	2
4.8	Lockwasher M3	551 430 400	2

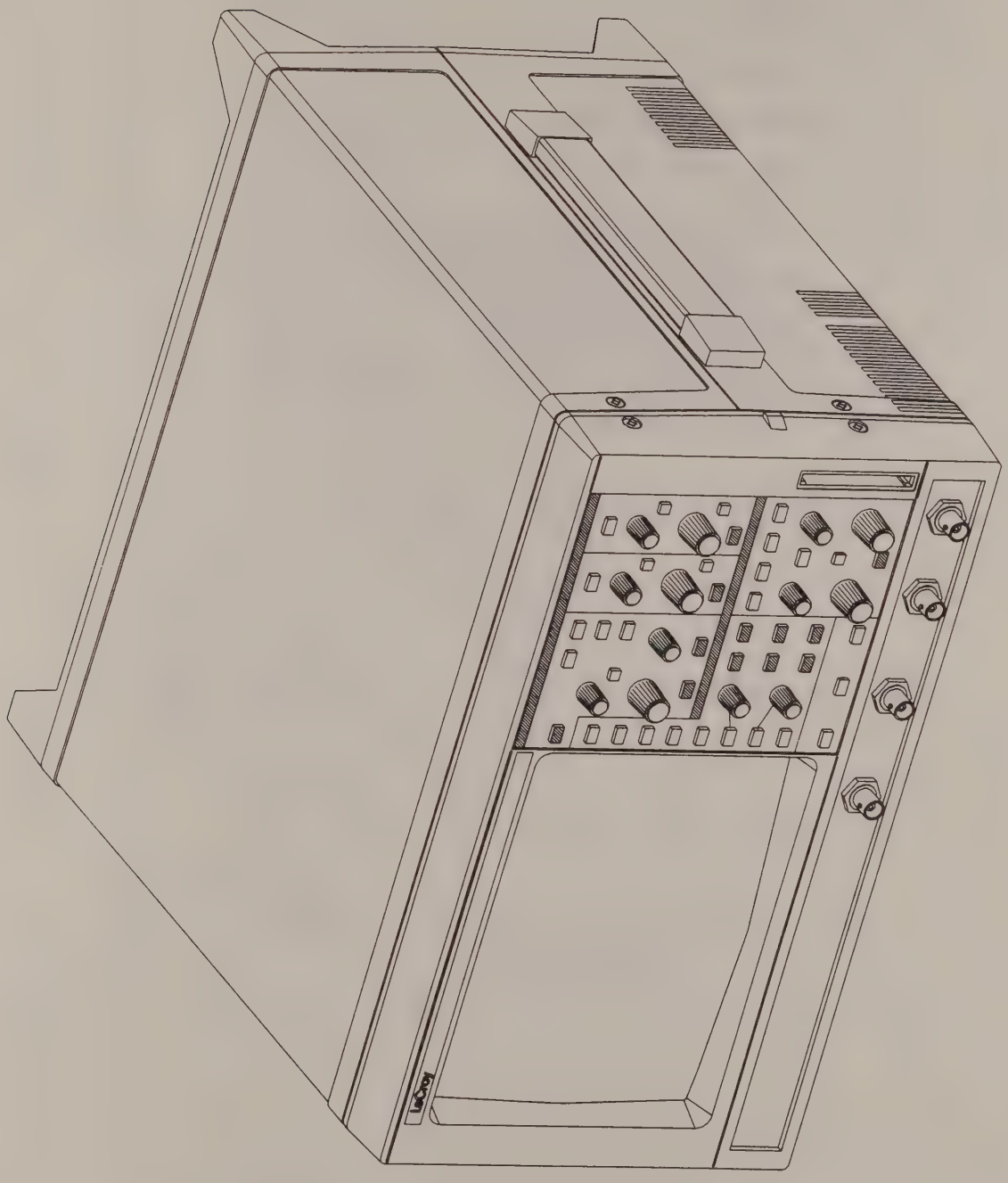


FIGURE 9.6: 9310 DSO FRONT VIEW

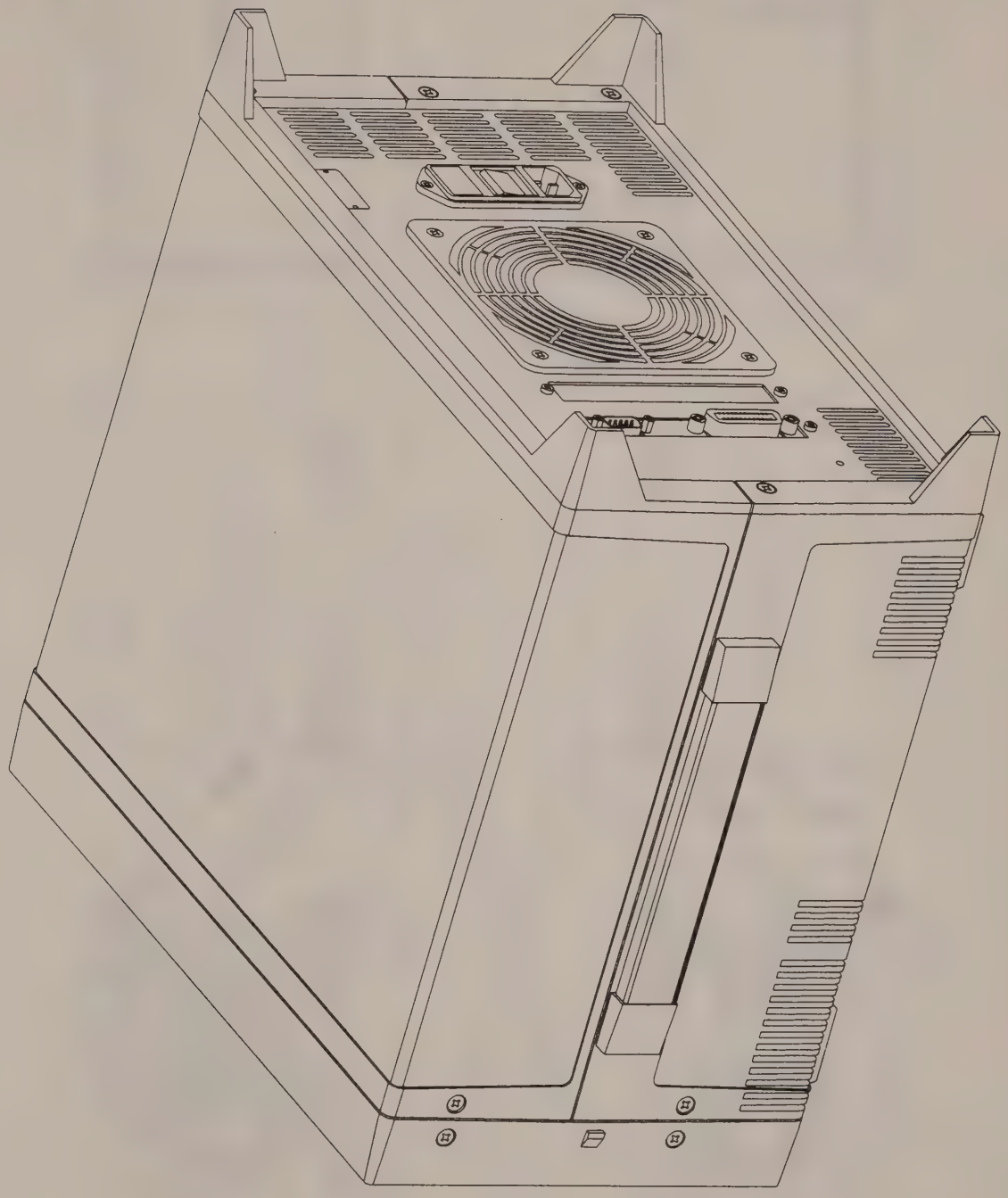


FIGURE 9.7: 9310 DSO REAR VIEW

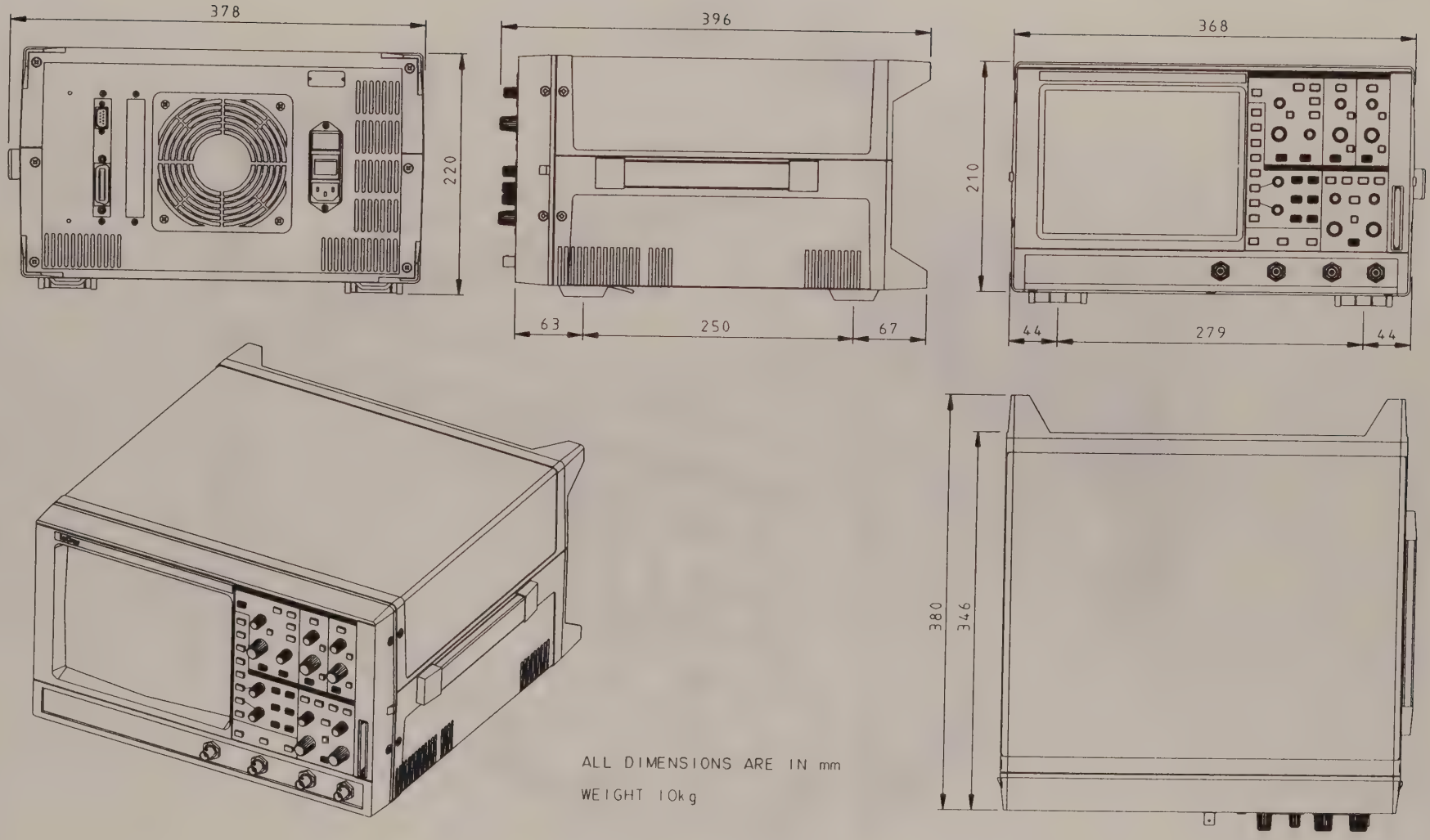


FIGURE 9.8: 9310 DSO DIMENSIONS

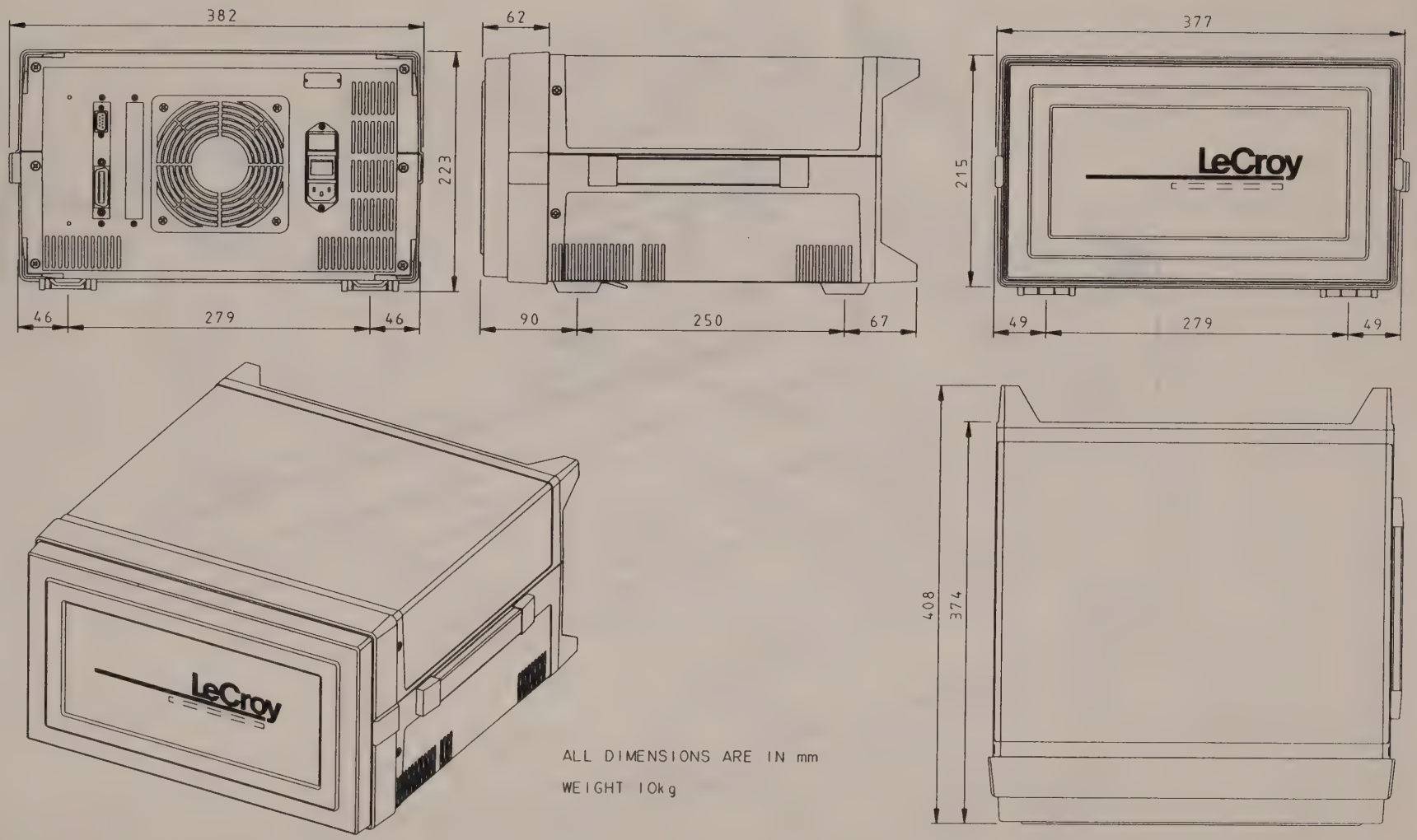


FIGURE 9.9: 9310 DSO DIMENSIONS WITH PROTECTIVE COVER

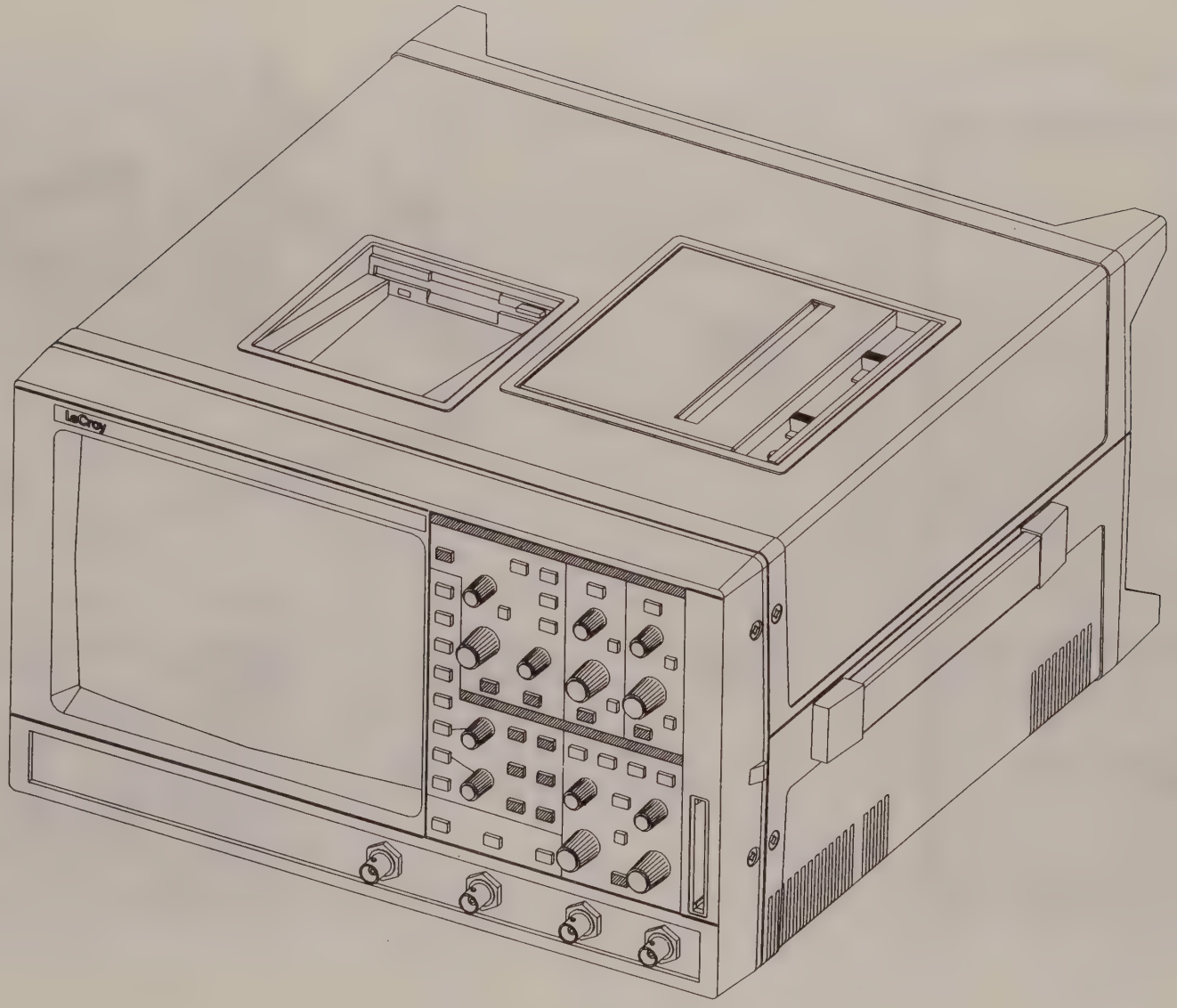


FIGURE 9.10: 9310 DSO WITH 93XX-FDGP OPTION

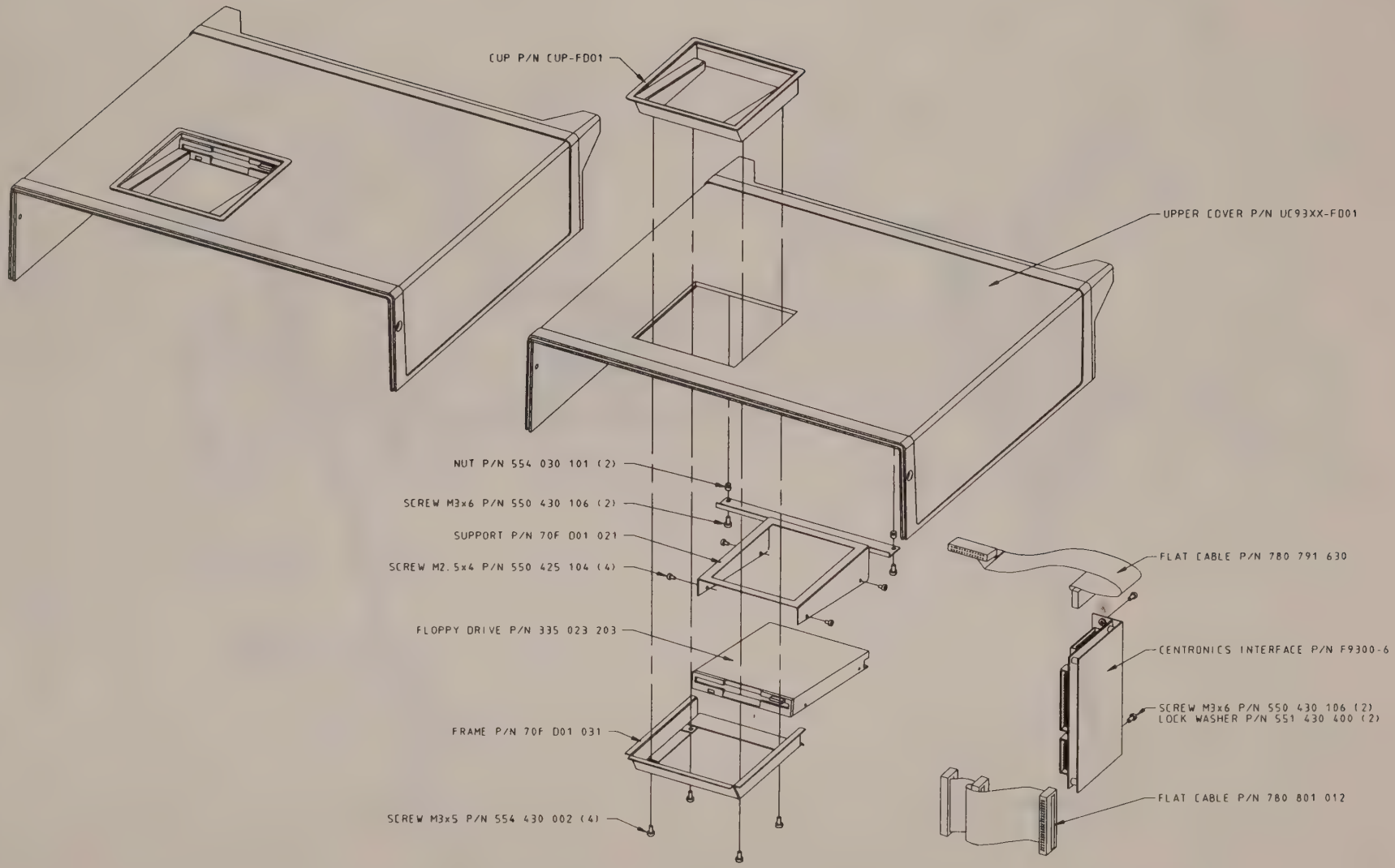


FIGURE 9.11: 93XX-FD01 OPTION ASSEMBLY

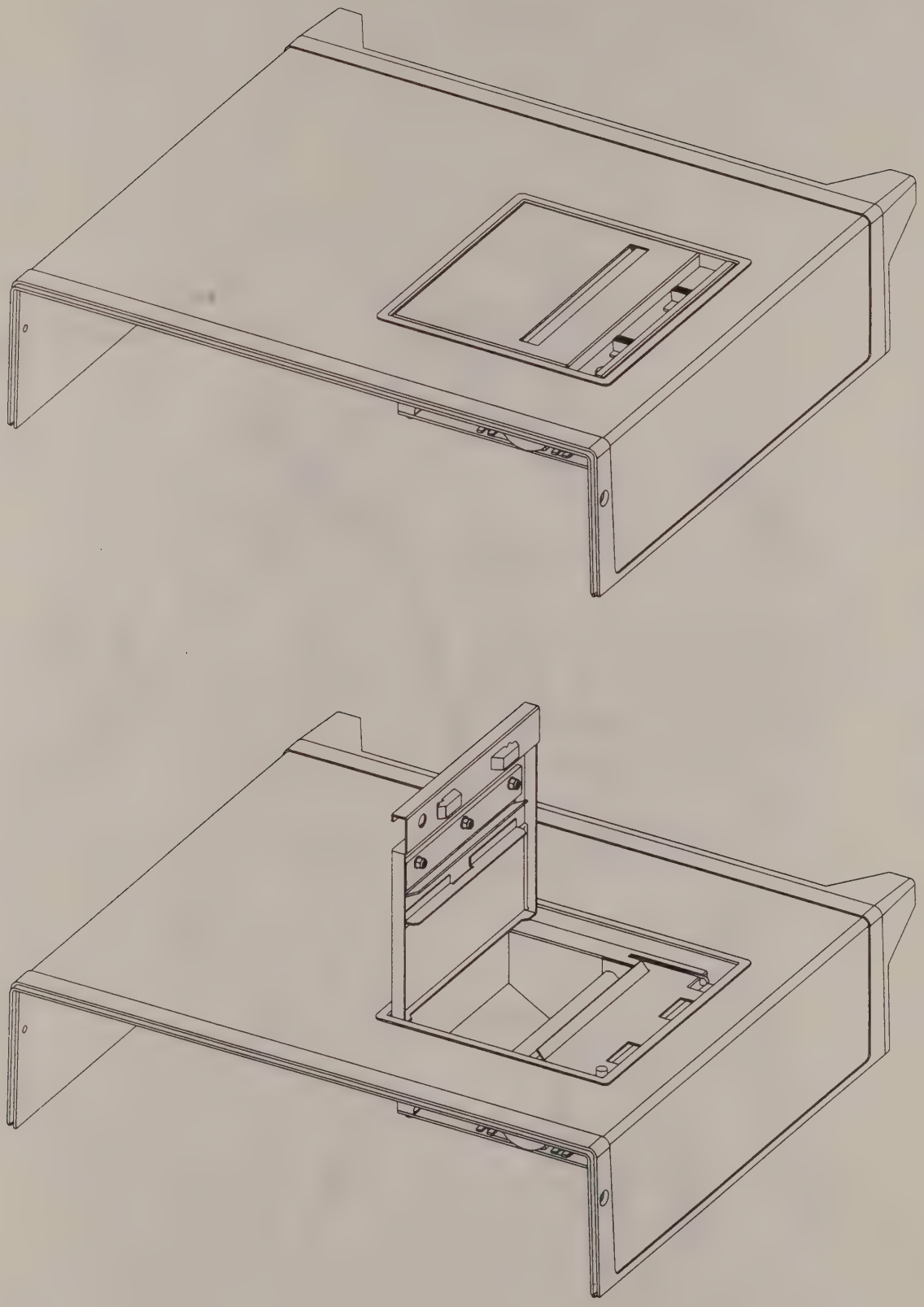


FIGURE 9.12: 93XX-GP01 OPTION

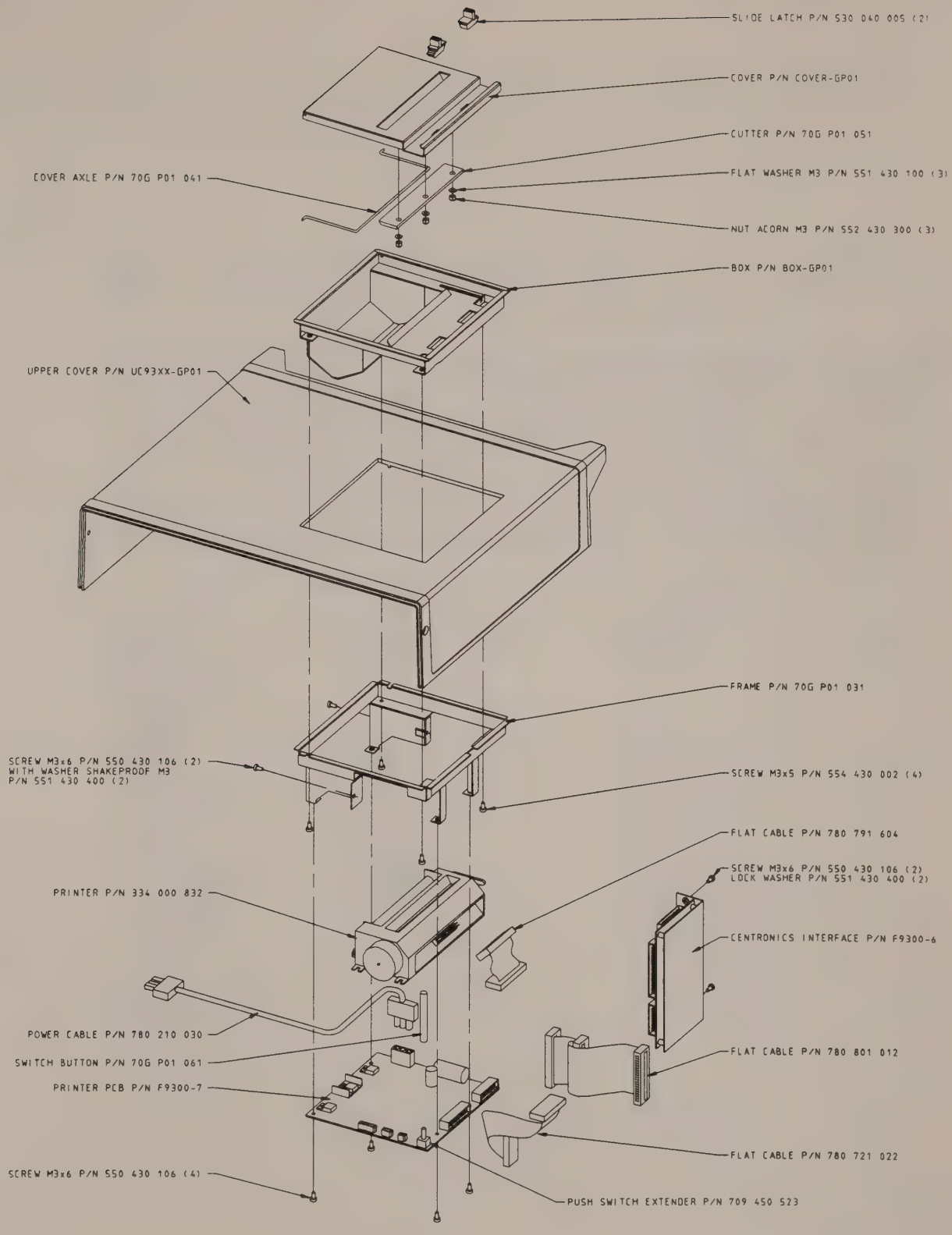


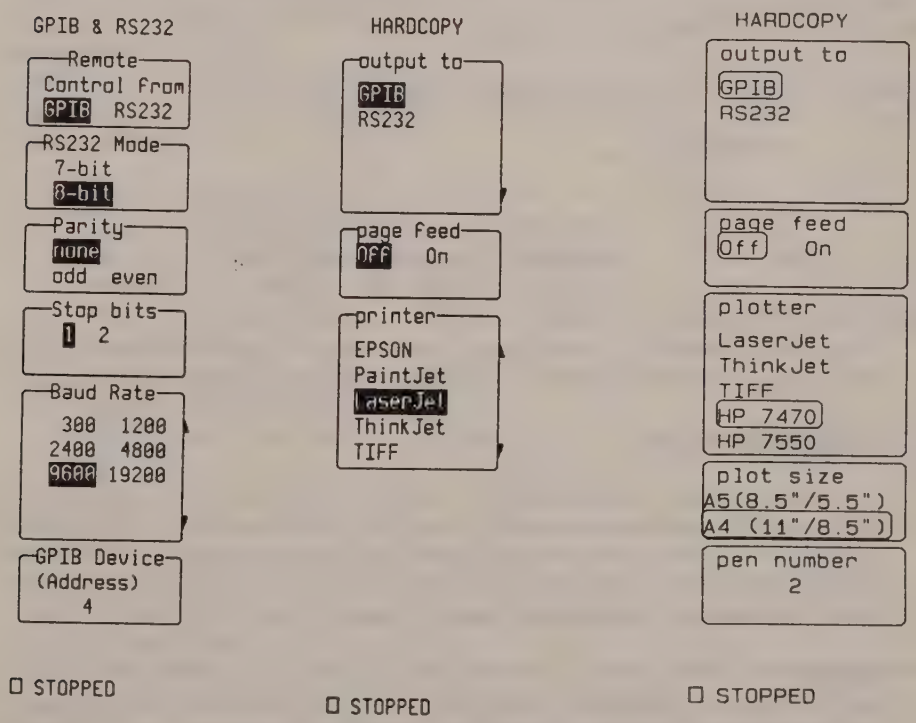
FIGURE 9.13: 93XX-GP01 OPTION ASSEMBLY

SECTION 10 CONNECTING the 9310 to a PLOTTER or a PRINTER

10.1 Introduction

LeCroy oscilloscopes are supplied with a list of plotters and printers known to work with them.
This list is not final, so any suggestions are welcome.

HP plotter responses to some RS-232 configuration commands have been evolved. Consequently, the 9310 generation DSO support HP plotters of two types, 7470A and 7550A. The only difference lies in the RS-232 initialization codes. They may however, despite these changes, work with HPGL compatible plotters from other manufacturers. If the HPGL data is used as input for a CAD or word processing system, it might be necessary to remove the data preceeding the in command. Before connecting a plotter to a 9310, do not forget to select the appropriate settings in the printer setup menu and the GPIB & RS-232 setup menu.



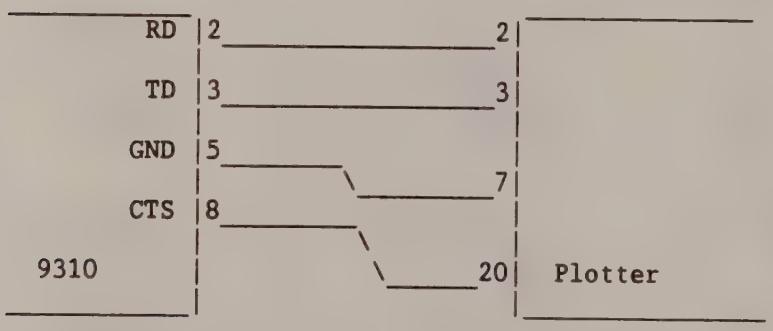
RS-232 connection

The following settings are assumed for the scope:
Baud rate: 9600
Character: 8 bits
Parity : none
Stop bits: 1
Any exceptions will be mentioned.

RS 232 interface

Pin 1: DCD
2: RD
3: TD
4: DTR
5: GND
6: DSR
7: RTS
8: CTS
9: RI

A cable with the following pinout can be used in almost every case:



The cable has D25 connector with male pins on the plotter side, and a D9 connector with female pins on the 9310 oscilloscope side.

GPIB Connection

To have a plot done through GPIB initiated with the front panel screen dump push button, you must set the 9310 in talk only mode by selecting remote control from RS-232, and the plotter in listen only mode.
If a computer controls the GPIB Bus, both the scope and the plotter must be set in addressed mode (remote control from GPIB).

Remark: the listen only mode does not work on some old HP plotters such as HP7585B or HP7475. The plotter must be set to listener before being able to receive any commands, which is a violation of the GPIB standard.

10.2 Plotters

10.2.1 HP 7470A Plotter

Switch settings:
- RS-232 Connection:
  S1 and S2: 0 0
  Y/D : D
  A4/US : User selectable
  B4 to B1 : 1 0 1 0

- GPIB listen only:
  A4/US : User selectable
  16 to 1 : 1 1 1 1 1

- GPIB Addressed:
  A4/US : User selectable
  16 to 1 : 0 0 1 1 1

10.2.2 HP 7550A Plotter

Responses to some ESC characters commands are not the same in this plotter as in older HP models like the 7470A. In fact, ESC sequences of commands which give excellent results in the 7470A can prevent any handshake in RS-232.
Problems of this kind have been reported in the case of ESC.R and ESC.@ commands. When combined with ESC.I and ESC.N, ESC.@ breaks up all handshakes.

RS-232 configuration:
- Enter into display 5 (HP-IB MONITOR...).
- Select STANDARD OF STANDARD/ENHANCED.
- Enter into SERIAL sub-menu (display 6)
- For DATA_FLOW, select REMOTE. Either STANDALONE or EAVESDROP may be chosen.
- Enter into display 7 (DUPLEX, PARITY, BAUD).
- Select FULL duplex.
- Configuration PARITY and BAUD rate to the same values as on the DSO.

A standard cable may be used, provided it has a female connector on the plotter side.
Do not start a plot while a sheet of paper is being loaded!

- GPIB configuration:
  If the scope is in TALK ONLY, the plotter must be in LISTEN ONLY. Selection will be done at display 5.
- Note : Its seems that the plotter must be powered off, then on again, to take any configuration change into account.

10.2.3 Hitachi 672 Graph Plotter (or NSA 672)

As this plotter is compatible with the 7470A, select this mode on the plotter menu page.

Switch settings

- RS-232 Connection:
  Sw. A, 1 and 2: 1 1 (ISO A3) or (ISO A4).
  Sw. A, 3 to 8 : 1 0 1 1 0 1
  Sw. B : 1 1 1 1
- Note:
  When switches are set to ISO A4, the pen must be manually repositioned at the top of the page (or plotter reset by powering it off and on) before loading a new sheet of paper.

10.3 Printers

Interfacing is possible through RS-232, GPIB directly, and in option through Centronics. The parallel interface F9300-6 (Centronics) is an option, see section 4.5.

10.3.1 Centronics Printers

Most printers use a Centronics parallel connection which makes direct connection possible if the 9310 is equipped with the optional Centronics interface F9300-6 board.
If the printer has a Centronics connector then it's a parallel printer, and the F9300-6 board is required or a serial to parallel converter.

If a serial to parallel converter is used, in the printer setup menu select device type Epson, and remote control from RS-232.
RS-232 Remote control port settings:

Baud rate:	9600 or 19200
Characters length (bits):	8
Parity:	none
Number of stop bits:	1

The following printers and printer switch positions have been tested via serial to parallel adapter.

	Switch 1	Switch 2
1. Epson LQ-1000	1, 2, 3, 4 ON	2, 6, 7 ON
2. Diconix 150P	1 ON	2, 6, 7 ON
3. HP-ThinkJet 2225C	2, 4, 5 ON	
4. HP-DeskJet 550 C	all down	6 up for 19200 bauds

Note: all Epson and Epson Compatible printers are likely to work if the switches are set properly. (Some experimentation may be required).

Some available serial to parallel converters need power through the RS-232 lines. Do not use them, as we do not guarantee that the serial port is able to furnish enough power.

10.3.2 RS-232 Printers

10.3.2.1 Epson FX80

It is possible to use the standard RS-232 cable. Such a printer has the optional RS-232 interface "#8143" installed. The configuration that follows is valid for the default scope setting. The standard cable is usable.
In the particular case of an FX850:

- the main switches SW1 SW2 remain at the factory configuration

SW1	1	2	3	4	5	6	7	8
	OFF	OFF	ON	OFF	OFF	ON	ON	ON

SW2	1	2	3	4
	ON	OFF	OFF	OFF

- the 8143 switches are set to:

1	2	3	4	5	6	7	8
ON	OFF	OFF	OFF	n/a	OFF	OFF	ON

- the 8143 jumpers remain at the factory settings:

J1	J2	J3	J4	J5	JC	JNOR	JRVE	JF	JX
OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	ON	OFF

Note: Epson printers only support XON/XOFF support handshake if they have a print buffer. Such printer are:
FX, FX+, JX-80, LQ-800/1000, EX-800 and LQ-25000.
Otherwise, use DTR/RTS handshake.

10.3.2.2 Citizen 120D

To use this printer with the default RS-232 setting and default printer setting of the 9310, select the following switch configuration:
DIP switch bank 1: all off except 3 and 8, DIP switch bank 2: all off.

10.3.2.3 HP LaserJet

Make sure that page feed is ON in the plotter menu to use the LaserJet. It is advisable to start out in single density with a size of A5. Then, depending upon the internal buffer size on the LaserJet, the image size and/or density can be increased. At one point, the internal buffer size of the DSO is also reached. The image is simply truncated, indicating that either density or size have to be reduced.

10.3.2.4 HP QuietJet

10.3.2.5 HP ThinkJet

To use printer with the default RS-232 setting and with the default cable select the following switch configuration:

- mode switch:

1	2	3	4	5	6	7	8
0	0	0	0: 11" page length 1: 12" page length	0	0	0	0

- RS-232 switch:

1	2	3	4	5
1	0	0	0	0
(use DTR handshake)	(8bits, parity none)		(9600 bauds)	

Note: it may be possible that old ThinkJet recognize only the Epson protocol. If it is the case use the Epson.

10.3.2.6 HP DeskJet 550C

The standard cable is usable. The printer has been tested at 19200 bauds with the following configuration :

Switch 1 or Bank A : all down
Switch 2 or Bank B : 6 up for 19200 bauds, all the other down

10.3.2.7 Brother Printers

The Brother M-1509 and M-1709 have been tested with a serial connection. On the oscilloscope select "Epson FX-80 or compatible printer".

The switch settings are identical for both the printers:

- SW1:

1	2	3	4	5	6	7	8
OM	ON	ON	OFF	ON	n/a	n/a	ON

- SW1:

1	2	3	4	5	6	7	8
<----------ALL OFF---------->							

- SW1:

1	2	3	4	5	6	7	8
OFF	OFF	OFF	OFF	11": OFF 12": ON	OFF	ON	OFF

10.3.3 GPIB Printers

10.3.3.1 HP QuietJet

Make sure the dip switches on the backplane of the printer are set to

- SRQ enable: 0

- GPIB listen only:
  Listen always: 1
  A5 to A1: 0 0 1 1 1

- GPIB Addressed:
  Listen always: 0
  A5 to A1: 0 0 1 1 1

10.3.3.2 HP ThinkJet (HP 2225A)

Make sure the dip switches on the backplane of the printer are set to

- SRQ Enable: 0

- GPIB listen only:
  Listen always: 1
  A5 to A1: 0 0 1 1 1

- GPIB Addressed:
  Listen always: 0
  A5 to A1: 0 0 1 1 1

10.3.3.3 HP PaintJet (black/white only)

Make sure the dip switches near the GPIB connector are set to:

- GPIB Listen only:
  NORM/SCS : NORM
  A3 to A1 : 1 1 1
  PC8/ROM8 : N/A
  ENG/MET : has to match paper size ENG = 11" MET = 12"

- GPIB addressed:
  NORM/SCS : NORM
  A3 to A1 : any combination except 1 1 1
  (correspond to add. 0-6)
  PC8/ROM8 : N/A
  ENG/MET : has to match paper size ENG = 11" MET = 12"

10.4 Information on GPIB

10.4.1 Introduction

This section is a simple description of the GPIB interface as an aid to understanding the interface in the 9310 DSO: it is not intended as a complete specification of the system.

The GPIB system is designed for the interaction of a number of devices, which may transmit or receive information as required. The system includes data lines over which the actual data are sent, bus management lines for control, and handshake lines to ensure correct acceptance of data at the right destination. The main features of the bus are summarized below:

Maximum number of devices	15
Maximum bus length	20 meters or 2 meters per device, whichever is less
Connection	star or chain

Note that more than half of any connected devices must be powered up, even if they will not be used.

Data lines		8 DIO 1 to 8
Handshake lines	DAV	Data available
	NRFD	Not ready for data
	NDAC	not data accepted
Bus management lines	EOI	End or identity
	IFC	Interface clear
	SRQ	Service request
	ATN	Attention
	REN	Remote enable

Active level	+0,4 V
Inactive level	+3,3 V

Note that all signal lines are active low, and that they are wire ORed to allow participation by all devices.
In addition, there are 8 ground lines, making a total of 24 lines.

10.4.2 Functions in the GPIB

In order to allow satisfactory interconnection of several devices the following functions must be provided

- Enabling any device to transmit data
- Preventing any device from transmitting data
- Enabling any device to receive data
- Preventing any device to receive data
- Transmitting data to a specific device
- Ensuring that only one device is transmitting
- Ensuring that transmitting takes place only when reception is possible
- Enabling any device to request servicing
- Identify type of data to be sent

Any device can be activated into the "talk" or "listen" state, and can be deactivated by the commands "untalk" and "unlisten". Also a device can be a "controller".

Maximum number of current talkers	1
Maximum number of current listeners	14
maximum number of current controllers	1

Function of bus lines:

- DAV Data available; talker says the data on the line are valid.

- NRFD Not ready for data; listener says it is not ready for more data. All listeners must release the NRFD line, i.e., let it go high, before talker can send.

- NDAC Not data accepted; listener says it has not yet accepted the data. Talker must hold all data lines steady until all listeners have released this line, i.e., it goes high.

Clearly, the NRFD and NDAC are easy to implement by a wired OR system, so that any one device asserting the signal prevents progress to the next step. Progress is made at the speed of the slowest listener. A simple timing diagram is given in figure 10.1, and another way of presenting the system is given in figure 10.2.

The bus management lines functions as follows:

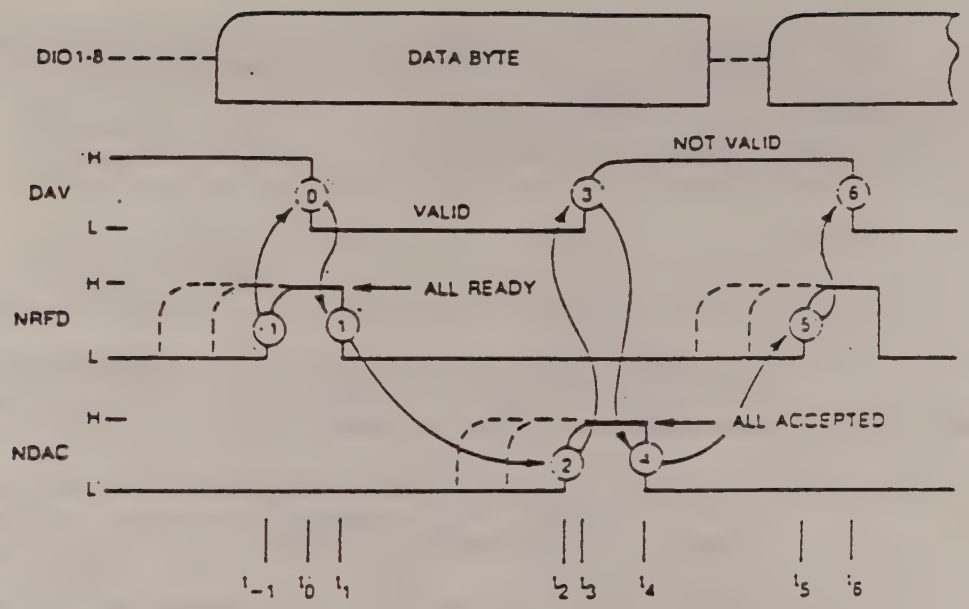
- EOI End Or Identify; talker sends this with last byte of a block transfer to indicate last byte. Also used with ATN to parallel poll devices for their status bit.

- IFC InterFace Clear; places the GPIB system into a quiescent state.
- SRQ Service ReQuest; any device can send it to the controller to indicate need for attention, and to request interruption of current operations.

- ATN ATeNtion; controller sends this to specify whether DIO lines are to be used for interface messages, e.g., addressing, or for data.

- REN Remote ENable; selects a device as being under local or remote control.

Addressing of the devices on the GPIB bus consult a specialized GPIB-IEEE488 document.
The principles of GPIB are quite simple - the system must wait for all users, and lines are wire ORed so that all can pull the lines down.
The handshake sequence is illustrated in two ways. In figure 10.1 the signal waveforms are sketched, while figure 10.2 is a flowchart.

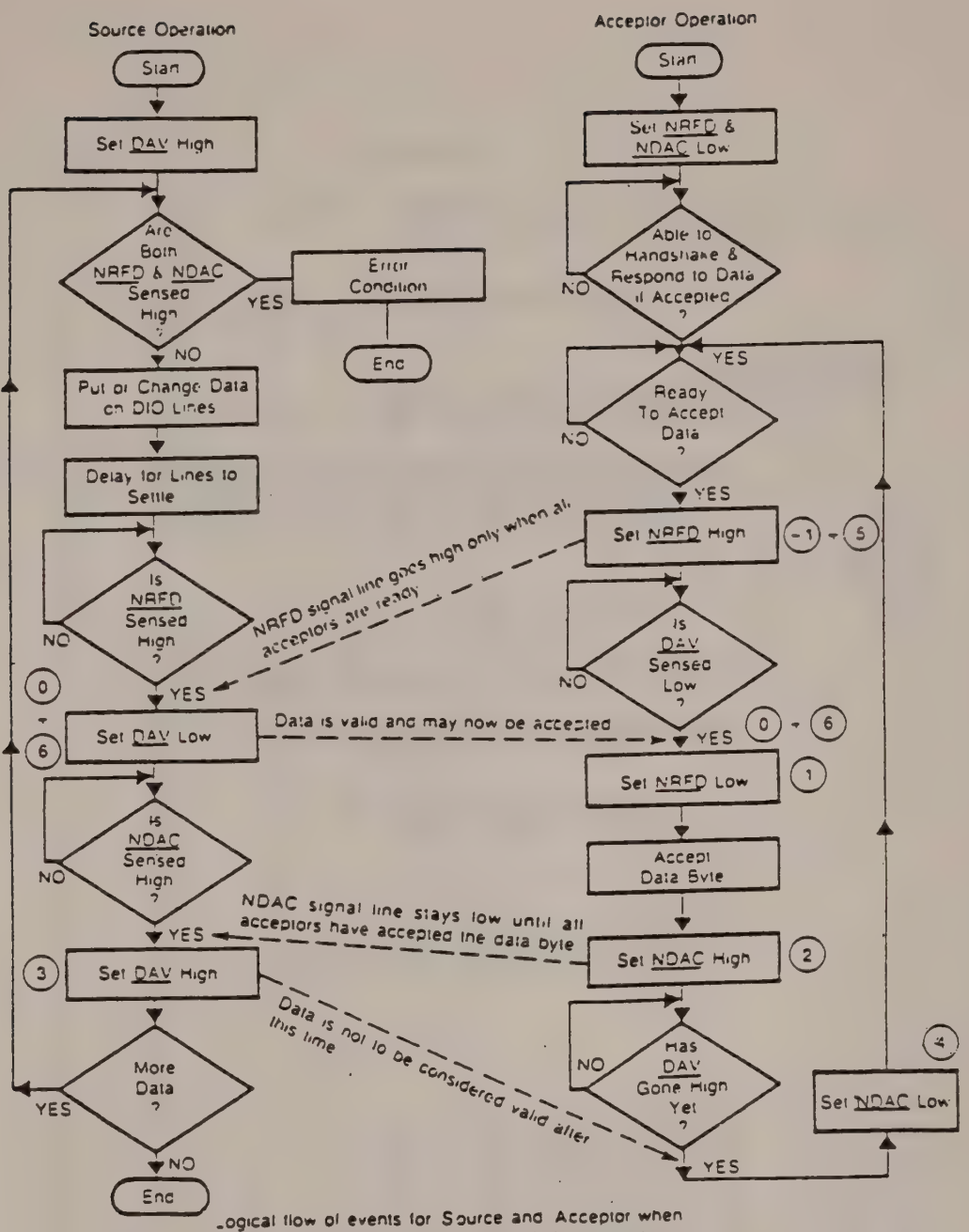


DATA BYTE TRANSFER IN GPIB IEEE-488

Figure 10.1

The handshake timing sequence proceeds as follows:

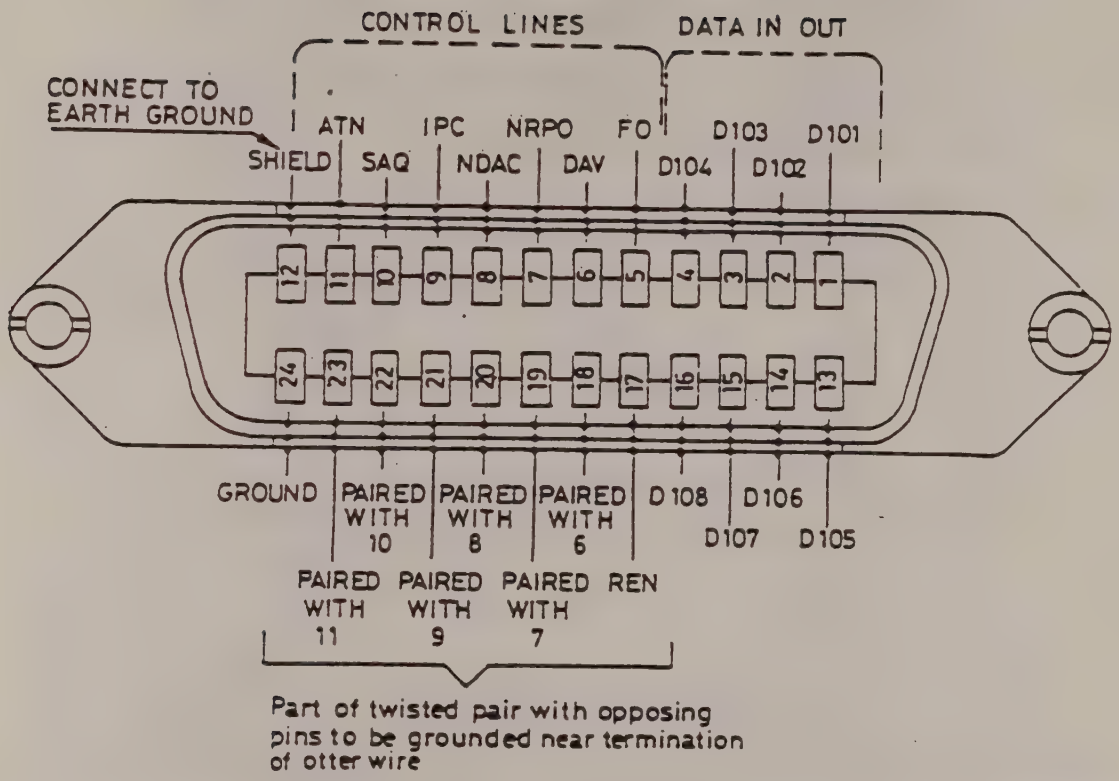
Preliminary	The source checks for presence of listeners and places the next data byte on the data lines DI01-8.
t-1	Acceptors one by one become ready for byte. Last one allows NRFD to go high.
t0	Sources pulls down DAV to validate data.
t1	The first litener to accept the data pulls down NRFD to show it is no longer ready for a new byte.
t2	The listeners one by one accept the data, and the last one lets NDAC go high.
t3	The source sets DAV high to show this byte is no longer valid.
t4	The listeners one by one accept this, the first one pulling NDAC low for the next cycle.
t5	As for t-1.



Logical flow of events for Source and Acceptor when transferring data using the handshake process

HANDSHAKE TIMING SEQUENCE IN GPIBIEEE-488

Figure 10.2



GPIB / IEEE-488 INTERFACE

APPENDIX A

Dec	Hex	ASCI char	IBM-PC char	IEEE-488 Multiline Interface Message (Sent with Attention true)
0	00	NUL		
1	01	SOH	^A	GTL - Go To Local
2	02	STX	^B	
3	03	ETX	^C	
4	04	EOT	^D	SDC - Selected Device Clear
5	05	ENQ	^E	PPC - Parallel Poll Configure
6	06	ACK	^F	
7	07	BEL		
8	08	BS		GET - Group Execute Trigger
9	09	HT		TCT - Take Control
10	0A	LF		
11	0B	VT		
12	0C	FF		
13	0D	CR		
14	0E	SO	^N	
15	0F	SI	^O	
16	10	DLE	^P	
17	11	DC1	^Q	LLO - Local Lock Out
18	12	DC2	^R	
19	13	DC3	^S	
20	14	DC4	^T	DCL - Device Clear
21	15	NAK	^U	PPU - Parallel Poll Unconfigure
22	16	SYN	^V	
23	17	ETB	^W	
24	18	CAN	^X	SPE - Serial Poll Enable
25	19	EM	^Y	SPD - Serial Poll Disable
26	1A	SUB		
27	1B	ESC	^[	
28	1C	FS	^\	
29	1D	GS	^]	
30	1E	RS	^^	
31	1F	US	^_	
32	20	SP		MLA - My Listen Address (listen 0)
33	21	!	!	MLA - My Listen Address (listen 1)
34	22	"	"	MLA - My Listen Address (listen 2)
35	23	#	#	MLA - My Listen Address (listen 3)
36	24	$	$	MLA - My Listen Address (listen 4)
37	25	%	%	MLA - My Listen Address (listen 5)
38	26	&	&	MLA - My Listen Address (listen 6)
39	27	'	'	MLA - My Listen Address (listen 7)
40	28	(	(	MLA - My Listen Address (listen 8)
41	29	)	)	MLA - My Listen Address (listen 9)
42	2A	*	*	MLA - My Listen Address (listen 10)
43	2B	+	+	MLA - My Listen Address (listen 11)
44	2C	,	,	MLA - My Listen Address (listen 12)
45	2D	-	-	MLA - My Listen Address (listen 13)

Dec	Hex	ASCII char	IBM-PC char	IEEE-488 Multiline Interface Message (Sent with Attention true)
46	2E	.	.	MLA - My Listen Address (listen 14)
47	2F	/	/	MLA - My Listen Address (listen 15)
48	30	0	0	MLA - My Listen Address (listen 16)
49	31	1	1	MLA - My Listen Address (listen 17)
50	32	2	2	MLA - My Listen Address (listen 18)
51	33	3	3	MLA - My Listen Address (listen 19)
52	34	4	4	MLA - My Listen Address (listen 20)
53	35	5	5	MLA - My Listen Address (listen 21)
54	36	6	6	MLA - My Listen Address (listen 22)
55	37	7	7	MLA - My Listen Address (listen 23)
56	38	8	8	MLA - My Listen Address (listen 24)
57	39	9	9	MLA - My Listen Address (listen 25)
58	3A	:	:	MLA - My Listen Address (listen 26)
59	3B	;	;	MLA - My Listen Address (listen 27)
60	3C	<	<	MLA - My Listen Address (listen 28)
61	3D	=	=	MLA - My Listen Address (listen 29)
62	3E	>	>	MLA - My Listen Address (listen 30)
63	3F	?	?	UNL - Unlisten
64	40	@	@	MTA - My Talk Address (talk 0)
65	41	A	A	MTA - My Talk Address (talk 1)
66	42	B	B	MTA - My Talk Address (talk 2)
67	43	C	C	MTA - My Talk Address (talk 3)
68	44	D	D	MTA - My Talk Address (talk 4)
69	45	E	E	MTA - My Talk Address (talk 5)
70	46	F	F	MTA - My Talk Address (talk 6)
71	47	G	G	MTA - My Talk Address (talk 7)
72	48	H	H	MTA - My Talk Address (talk 8)
73	49	I	I	MTA - My Talk Address (talk 9)
74	4A	J	J	MTA - My Talk Address (talk 10)
75	4B	K	K	MTA - My Talk Address (talk 11)
76	4C	L	L	MTA - My Talk Address (talk 12)
77	4D	M	M	MTA - My Talk Address (talk 13)
78	4E	N	N	MTA - My Talk Address (talk 14)
79	4F	O	O	MTA - My Talk Address (talk 15)
80	50	P	P	MTA - My Talk Address (talk 16)
81	51	Q	Q	MTA - My Talk Address (talk 17)
82	52	R	R	MTA - My Talk Address (talk 18)
83	53	S	S	MTA - My Talk Address (talk 19)
84	54	T	T	MTA - My Talk Address (talk 20)
85	55	U	U	MTA - My Talk Address (talk 21)
86	56	V	V	MTA - My Talk Address (talk 22)
87	57	W	W	MTA - My Talk Address (talk 23)
88	58	X	X	MTA - My Talk Address (talk 24)
89	59	Y	Y	MTA - My Talk Address (talk 25)
90	5A	Z	Z	MTA - My Talk Address (talk 26)
91	5B	[	[	MTA - My Talk Address (talk 27)
92	5C	\	\	MTA - My Talk Address (talk 28)

Dec	Hex	ASCII char	IBM-PC char	IEEE-488 Multiline Interface Message (Sent with Attention true)
93	5D	]	]	MTA - My Talk Address (talk 29)
94	5E	^	^	MTA - My Talk Address (talk 30)
95	5F	_	_	UNT - Untalk
96	60	`	`	
97	61	a	a	
98	62	b	b	
99	63	c	c	
100	64	d	d	
101	65	e	e	
102	66	f	f	
103	67	g	g	
104	68	h	h	
105	69	i	i	
106	6A	j	j	
107	6B	k	k	
108	6C	l	l	
109	6D	m	m	
110	6E	n	n	
111	6F	o	o	
112	70	p	p	
113	71	q	q	
114	72	r	r	
115	73	s	s	
116	74	t	t	
117	75	u	u	
118	76	v	v	
119	77	w	w	
120	78	x	x	
121	79	y	y	
122	7A	z	z	
123	7B	{	{	
124	7C	|	|	
125	7D	}	}	
126	7E	~	~	
127	7F	NUL		
128	80		Ç	
129	81		ü	
130	82		é	
131	83		â	
132	84		ä	
133	85		à	
134	86		å	
135	87		ç	
136	88		ê	
137	89		ë	
138	8A		è	
139	8B		ï	

Dec	Hex	ASCII char	IBM-PC char	IEEE-488 Multiline Interface Message (Sent with Attention true)
140	8C		î	
141	8D		ì	
142	8E		Ä	
143	8F		Å	
144	90		É	
145	91		æ	
146	92		Æ	
147	93		ô	
148	94		ö	
149	95		ò	
150	96		û	
151	97		ù	
152	98			
153	99		Ö	
154	9A		Ü	
155	9B		¢	
156	9C		£	
157	9D		¥	
158	9E		₧	
159	9F		ƒ	
160	A0		á	
161	A1		í	
162	A2		ó	
163	A3		ú	
164	A4		ñ	
165	A5		Ñ	
166	A6		ª	
167	A7		º	
168	A8		¿	
169	A9		⌐	
170	AA		¬	
171	AB		½	
172	AC		¼	
173	AD		¡	
174	AE		«	
175	AF		»	
176	B0			
177	B1		▒	
178	B2		▓	
179	B3		│	
180	B4		┤	
181	B5		╡	
182	B6		╢	
183	B7		╖	
184	B8		╕	
185	B9		╣	
186	BA		║	
187	BB		╗	

Dec	Hex	ASCII char	IBM-PC char	IEEE-488 Multiline Interface Message (Sent with Attention true)
188	BC		╝	
189	BD		╜	
190	BE		╛	
191	BF		┐	
192	C0		└	
193	C1		┴	
194	C2		┬	
195	C3		├	
196	C4		─	
197	C5		┼	
198	C6		╞	
199	C7		╟	
200	C8		╚	
201	C9		╔	
202	CA		╩	
203	CB		╦	
204	CC		╠	
205	CD		═	
206	CE		╬	
207	CF		╧	
208	D0		╨	
209	D1		╤	
210	D2		╥	
211	D3		╙	
212	D4		╘	
213	D5		╒	
214	D6		╓	
215	D7		╫	
216	D8		╪	
217	D9		┘	
218	DA		┌	
219	DB		▉	
220	DC		▌	
221	DD		▐	
222	DE		▊	
223	DF		▀	
224	E0		α	
225	E1		ß	
226	E2		Γ	
227	E3		π	
228	E4		Σ	
229	E5		σ	
230	E6		µ	
231	E7		τ	
232	E8		Φ	
233	E9			
234	EA		Ω	

Dec	Hex	ASCII char	IBM-PC char	IEEE-488 Multiline Interface Message (Sent with Attention true)
235	EB		δ	
236	EC		∞	
237	ED		ϕ	
238	EE		ε	
239	EF		∩	
240	F0		≡	
241	F1		±	
242	F2		≥	
243	F3		≤	
244	F4		⌠	
245	F5		⌡	
246	F6		÷	
247	F7		≈	
248	F8		°	
249	F9		∙	
250	FA		·	
251	FB		√	
252	FC		n	
253	FD		²	
254	FE		■	
255	FF			

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